5 Spd. Manual Transmission 02J - New Beetle

GENERAL, TECHNICAL DATA

TRANSMISSION IDENTIFICATION

The 5-speed manual transmission 02J is installed in the New Beetle from 1998 in conjunction with 4-cylinder engines.

Application. See **CODE LETTERS, TRANSMISSION APPLICATION, RATIOS, CAPACITIES** .

Location on transmission

Code letters and date of manufacture (arrow 1) manual transmission 02J (arrow 2)

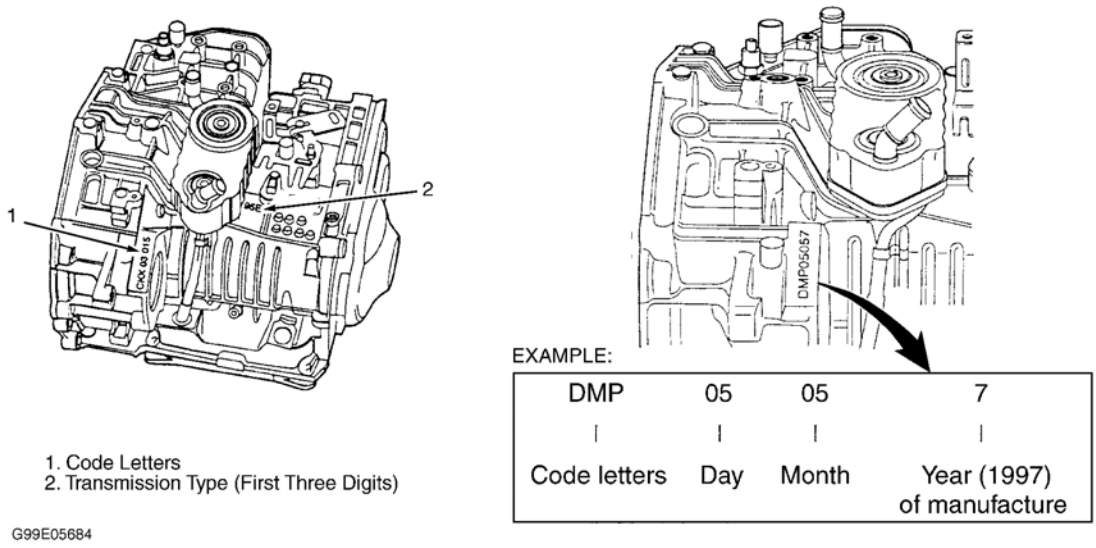

Fig. 1: Locating Code Letters And Date Of Manufacture
Courtesy of VOLKSWAGEN OF AMERICA, INC.

Manual transmission 02J (arrow -2-)

Automatic transmission			01M					
Transmission	Codes		DYQ		ECN		ECP	
	Manufactured	from	11.97		08.98		08.98	
		to	08.98		05.99		05.99	
Torque converter For turbine shaft with sleeve bearing see TORQUE CONVERTER IDENTIFICATION	Codes		QBDC		QCDC		QCDC	
For turbine shaft without sleeve bearing see TORQUE CONVERTER IDENTIFICATION			QBDD		QCDD		QBDD	
Valve body	Codes		QFB		QFB		QFB	
	Manufactured	from	01.97		01.97		01.97	
		to						
Number of plates			Inner	Outer	Inner	Outer	Inner	Outer
	Clutch -K1-		5	5	5	5	5	5
	Clutch -K2-		4	4	5	5	5	5
	Clutch -K3-		5	4	6	5	6	5
	Brake -B1-		5	5	5	5	6	6
	Brake -B2-		4	5	5	6	5	6
Application	Model		New Beetle 1998		New Beetle 1998		New Beetle 1998	
	Engine		2.0 ltr. - 85 kW		1.9 ltr. - 66 kW TDI		1.8 ltr. - 110 kW	

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Fig. 2: Locating Code Letters And Date Of Manufacture Manual Transmission 02J
Courtesy of VOLKSWAGEN OF AMERICA, INC.

Code letters and date of manufacture of transmission

Transmission	Codes		DYQ	ECN	ECP
Ratios	1st gear		2.714	2.714	2.714
	2nd gear		1.551	1.441	1.441
	3rd gear		1.000	1.000	1.000
	4th gear		0.679	0.742	0.742
	Reverse gear		2.111	2.884	2.884
Intermediate drive	No. of teeth	Input gear	61	45	45
		Output gear	63	44	44
	Ratio		1.033	0.978	0.978
Final drive	No. of teeth	Drive pinion	16	20	15
		Ring gear	78	74	68
	Ratio		4.875	3.700	4.533
Drive shaft	Flange dia. mm		Triple roller	Triple roller	Triple roller
ATF cooler	Equipment		Pressure-side 6-row	Pressure-side 6-row	Pressure-side 6-row

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Fig. 3: Identifying Code Letters And Date Of Manufacture Of Transmission
Courtesy of VOLKSWAGEN OF AMERICA, INC.

TRANSMISSION CODE LETTERS AND DATE SPECIFICATION

Example:	DZQ	06	05	8
Explanatio n	Code letters	Day	Month	Year (1998) of manufacture

Additional data depends on manufacture.

NOTE: The transmission code letters are also shown on the vehicle identification plates.

02J TRANSMISSION SPECIFICATIONS (TO 09.00) - 1 OF 4

Manual transmission		**5-speed 02J**		
Code letters		**DQY**	**DZQ**	**EBJ**
Manufactured	from to	06.97 09.00	08.97 08.98	08.98 09.00
Application	Model	**New Beetle From 1998 And On**	**New Beetle From 1998 And On**	**New Beetle From 1998 And On**
Application	Engine	1.9 l - 66 kW TDI	2.0 I - 85 kW	1.9 I - 66 kW TDI
Ratio: $Z_2 : Z_1$	Final drive	61 : 18 = 3.389	72 : 17 = 4.235	61 : 18 = 3.389
	1st gear	34 : 9 = 3.778	34 : 9 = 3.778	34 : 9 = 3.778
	2nd gear	36 : 17 = 2.118	36 : 17 = 2.118	36 : 17 = 2.118
	3rd gear	34 : 25 = 1.360	34 : 25 = 1.360	34 : 25 = 1.360
	4th gear	34 : 35 = 0.971	35 : 34 = 1.029	34 : 35 = 0.971
	5th gear	34 : 45 = 0.756	36 : 43 = 0.837	34 : 45 = 0.756
	6th gear	-	-	-
	Reverse gear	18 : 9 x 36 : 20 = 3.600	18 : 9 x 36 : 20 = 3.600	18 : 9 x 36 : 20 = 3.600
Speedometer		13 : 22 = 0.591	13 : 22 = 0.591	13 : 22 = 0.591

02J TRANSMISSION SPECIFICATIONS (TO 09.00) - 2 OF 4

Code letters	**DQY**	**DZQ**	**EBJ**
Lubricant capacity	2.0 Liters	2.0 Liters	2.0 Liters
Lubricant specification	Transmission oil G50 SAE 75W90 (synthetic oil)		
Clutch control	hydraulic	hydraulic	hydraulic
Clutch disc diameter	228 mm(1) , (2)	215 mm	228 mm(1) , (2)
Drive shaft flange diameter	100 mm	100 mm	100 mm
i. overall ratio in top gear	2.562	3.545	2.562

(1) Two-part flywheel

(2) Allocate the clutch plate using parts catalog.

New selector mechanism as of 06.99. Transmission selector cover has been revised.

All transmissions can be filled with transmission oil G 052 726 A2 SAE 75W.

02J TRANSMISSION SPECIFICATIONS (TO 09.00) - 3 OF 4

Manual transmission		**5-speed 02J**		
Code letters		**EBP**	**EBQ**	**EGR**
Manufactured	from	05.99	05.99	09.00

	to	09.00	09.00	
Application	Model	**New Beetle From 1998 And On**	**New Beetle From 1998 And On**	**New Beetle From 1998 And On**
Application	Engine	2.0 I - 85 kW	1.8 I - 110 kW Turbo	1.9 I - 66 kW TDI
Ratio: $Z_2 : Z_1$	Final drive	72 : 17 = 4.235	63 : 16 = 3.938	61 : 18 = 3.389
	1st gear	34 : 9 = 3.778	33 : 10 = 3300	34 : 9 = 3.778
	2nd gear	36 : 17 = 2.118	35 : 18 = 1.944	36 : 17 = 2.118
	3rd gear	34 : 25 = 1.360	34 : 26 = 1.308	34 : 25 = 1.360
	4th gear	35 : 34 = 1.029	35 : 34 = 1.029	34 : 35 = 0.971
	5th gear	36 : 43 = 0.837	36 : 43 = 0.837	34 : 45 = 0.756
	6th gear	-	-	-
	Reverse gear	18 : 9 x 36 : 20 = 3.600	17 : 10 x 36 : 20 = 3.060	18 : 9 x 36 : 20 = 3.600
Speedometer		13 : 22 = 0.591	13 : 22 = 0.591	13 : 22 = 0.591

From 09.00 modified synchronization for the first gear

02J TRANSMISSION SPECIFICATIONS (TO 09.00) - 4 OF 4

Code letters	**EBP**	**EBQ**	**EGR**
Lubricant capacity	2.0 Liters	2.0 Liters	2.0 Liters
Lubricant specification	Transmission oil G50 SAE 75W90 (synthetic oil)		
Clutch control	hydraulic	hydraulic	hydraulic
Clutch disc diameter	215 mm	225 mm(1)	228 mm(1)
Drive shaft flange diameter	100 mm	108 mm(2)	100 mm
i. overall ratio in top gear	3.545	3.296	2.562
(1) Two-part flywheel			
(2) Triple roller joint drive shaft			

New selector mechanism as of 06.99. Transmission selector cover has been revised.

All transmissions can be filled with transmission oil G 052 726 A2 SAE 75W.

02J TRANSMISSION SPECIFICATIONS (FROM 09.00) - 1 OF 8

Manual transmission		**5-speed 02J**		
Code letters		**EGS**	**EGT**	**EGX**
Manufactured	from to	09.00	09.00	09.00
Application	Model	**New Beetle From 1998 And On**	**New Beetle From 1998 And On**	**New Beetle From 1998 And On**
Application	Engine	1.9 I - 74 kW	2.0 I - 85 kW	1.8 I - 110 kW

		TDI		Turbo
Ratio: $Z_2 : Z_1$	Final drive	61 : 18 = 3.389	72 : 17 = 4.235	63 : 16 = 3.938
	1st gear	34 : 09 = 3.778	34 : 9 = 3.778	33 : 10 = 3.300
	2nd gear	33 : 16 = 2.063	36 : 17 = 2.118	35 : 18 = 1.944
	3rd gear	31 : 23 = 1.348	34 : 25 = 1.360	34 : 26 = 1.308
	4th gear	29 : 30 = 0.967	35 : 34 = 1.029	35 : 34 = 1.029
	5th gear	30 : 39 = 0.769	36 : 43 = 0.837	36 : 43 = 0.837
	6th gear	-	-	-
	Reverse gear	18 : 9 x 36 : 20 = 3.600	18 : 9 x 36 : 20 = 3.600	17 : 10 x 36 : 20 = 3.060
Speedometer		13 : 22 = 0.591	13 : 22 = 0.591	13 : 22 = 0.591

From 09.00 modified synchronization for the first gear

02J TRANSMISSION SPECIFICATIONS (FROM 09.00) - 2 OF 8

Code letters	**EGS**	**EGT**	**EGX**
Lubricant capacity	2.0 Liters	2.0 Liters	2.0 Liters
Lubricant specification	Transmission oil G50 SAE 75W90 (synthetic oil)		
Clutch control	hydraulic	hydraulic	hydraulic
Clutch disc diameter	228 mm(1)	215 mm	225 mm(1)
Drive shaft flange diameter	108 mm(2)	100 mm	108 mm(2)
i. overall ratio in top gear	2.606	3.545	3.296
(1) Two-part flywheel			
(2) Triple roller joint drive shaft			

New selector mechanism as of 06.99. Transmission selector cover has been revised.

All transmissions can be filled with transmission oil G 052 726 A2 SAE 75W.

02J TRANSMISSION SPECIFICATIONS (FROM 09.00) - 3 OF 8

Manual transmission		**5-speed 02J**		
Code letters		**EKG**	**EZH**	**EZK**
Manufactured	from to	09.00	09.00 10.99	09.00
Application	Model	**New Beetle From 1998 And On**	**New Beetle From 1998 And On**	**New Beetle From 1998 And On**
Application	Engine	2.0 I - 85 kW	2.0 I - 85 kW	2.0 I - 85 kW
Ratio: $Z_2 : Z_1$	Final drive	72 : 17 = 4.235	72 : 17 = 4.235	72 : 17 = 4.235
	1st gear	34 : 9 = 3.778	34 : 9 = 3.778	34 : 9 = 3.778
	2nd gear	36 : 17 = 2.118	36 : 17 = 2.118	36 : 17 = 2.118

	3rd gear	34 : 25 = 1.360	34 : 25 = 1.360	34 : 25 = 1.360
	4th gear	35 : 34 = 1.029	35 : 34 = 1.029	35 : 34 = 1.029
	5th gear	36 : 43 = 0.837	36 : 43 = 0.837	36 : 43 = 0.837
	6th gear	-	-	-
	Reverse gear	18 : 9 x 36 : 20 = 3.600	18 : 9 x 36 : 20 = 3.600	18 : 9 x 36 : 20 = 3.600
Speedometer		13 : 22 = 0.591	13 : 22 = 0.591	13 : 22 = 0.591

From 09.00 modified synchronization for the first gear

02J TRANSMISSION SPECIFICATIONS (FROM 09.00) - 4 OF 8

Code letters	**EKG**	**EZH**	**EZK**
Lubricant capacity	2.0 Liters	2.0 Liters	2.0 Liters
Lubricant specification	Transmission oil G50 SAE 75W90 (synthetic oil)		
Clutch control	hydraulic	hydraulic	hydraulic
Clutch disc diameter	215 mm	215 mm	215 mm
Drive shaft flange diameter	100 mm	100 mm	100 mm
i. overall ratio in top gear	3.545	3.545	3.545

New selector mechanism as of 06.99. Transmission selector cover has been revised.

All transmissions can be filled with transmission oil G 052 726 A2 SAE 75W.

02J TRANSMISSION SPECIFICATIONS (FROM 09.00) - 5 OF 8

Manual transmission		**5-speed 02J**		
Code letters		**FBV**	**FBW**	**FDS**
Manufactured	from to	05.00 09.00	05.00 09.00	09.00
Application	Model	**New Beetle From 1998 And On**	**New Beetle From 1998 And On**	**New Beetle From 1998 And On**
Application	Engine	2.0 l - 85 kW	1.8 l - 110 kW Turbo	1.8 l - 110 kW Turbo
Ratio: $Z^2 : Z^1$	Final drive	72 : 17 = 4.235	63 : 16 = 3.938	63 : 16 = 3.938
	1st gear	34 : 9 = 3.778	33 : 10 = 3.300	33 : 10 = 3.300
	2nd gear	36 : 17 = 2.118	35 : 18 = 1.944	35 : 18 = 1.944
	3rd gear	34 : 25 = 1.360	34 : 26 = 1.308	34 : 26 = 1.308
	4th gear	35 : 34 = 1.029	35 : 34 = 1.029	35 : 34 = 1.029
	5th gear	36 : 43 = 0.837	36 : 43 = 0.837	36 : 43 = 0.837
	6th gear	-	-	-
	Reverse gear	18 :9 x 36 : 20 = 3.600	17 : 10 x 36 : 20 = 3.060	17 : 10 x 36 : 20 = 3.060
Speedometer		13 : 22 = 0.591	13 : 22 = 0.591	13 : 22 = 0.591

From 09.00 modified synchronization for the first gear

02J TRANSMISSION SPECIFICATIONS (FROM 09.00) - 6 OF 8

Code letters	**FBV**	**FBW**	**FDS**
Lubricant capacity	2.0 Liters	2.0 Liters	2.0 Liters
Lubricant specification	Transmission oil G50 SAE 75W90 (synthetic oil)		
Clutch control	hydraulic	hydraulic	hydraulic
Clutch disc diameter	215 mm	225 mm(1)	225 mm(1)
Drive shaft flange diameter	100 mm	108 mm(2)	108 mm(2)
i. overall ratio in top gear	3.545	3.296	3.296
(1) Two-part flywheel (2) Triple roller joint drive shaft			

New selector mechanism as of 06.99. Transmission selector cover has been revised.

All transmissions can be filled with transmission oil G 052 726 A2 SAE 75W.

02J TRANSMISSION SPECIFICATIONS (FROM 09.00) - 7 OF 8

Manual transmission		**5-speed 02J**
Code letters		**FDU**
Manufactured	from to	09.00
Application	Model	**New Beetle From 1998 And On**
Application	Engine	2.0 I - 85 kW
Ratio: $Z^2 : Z^1$	Final drive	72 : 17 = 4.235
	1st gear	34 : 9 = 3.778
	2nd gear	36 : 17 = 2.118
	3rd gear	34 : 25 = 1.360
	4th gear	35 : 34 = 1.029
	5th gear	36 : 43 = 0.837
	6th gear	-
	Reverse gear	18 : 9 x 36 : 20 = 3.600
Speedometer		13 : 22 = 0.591

From 09.00 modified synchronization for the first gear

02J TRANSMISSION SPECIFICATIONS (FROM 09.00) - 8 OF 8

Code letters	**FDU**
Lubricant capacity	2.0 Liters
Lubricant specification	Transmission oil G50 SAE 75W90 (synthetic oil)
Clutch control	hydraulic

Clutch disc diameter	215 mm
Drive shaft flange diameter	100 mm
i. overall ratio in top gear	3.545

New selector mechanism as of 06.99. Transmission selector cover has been revised.

All transmissions can be filled with transmission oil G 052 726 A2 SAE 75W.

TRANSMISSION LAYOUT

Designation

NOTE: The following list refers to items in Fig. 4 .

1. **Engine**
2. **Clutch**
3. **Transmission**
4. **Input shaft**
5. **Output shaft/pinion shaft**
6. **Differential**

Arrows point in direction of travel

Automatic transmission			01M					
Gearbox	Code letters		EFB		ECV		FDB	
	Manufactured	from	10.98		08.98		03.00	
		to	05.99		05.99			
Torque converter	Codes							
For turbine shaft with sleeve bearing see TORQUE CONVERTER IDENTIFICATION			QBDC		QBDC		-	
For turbine shaft without sleeve bearing see TORQUE CONVERTER IDENTIFICATION			QBDD		QADD		QCDD	
Valve body	Codes		QFB		QFB		QFB	
	Manufactured	from	01.97		01.97		03.00	
		to						
Number of plates			Inner	Outer	Inner	Outer	Inner	Outer
	Clutch -K1-		5	5	5	5	5	5
	Clutch -K2-		4	4	4	4	5	5
	Clutch -K3-		5	4	5	4	6	5
	Brake -B1-		5	5	5	5	5	5
	Brake -B2-		4	5	4	5	5	6
Application	Model		New Beetle 1998		New Beetle 1998		New Beetle 1998	
	Engine		2.0 ltr. - 85		2.0 ltr. - 85		1.9 ltr. - 66 kW	

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Fig. 4: Identifying Transmission Layout (1 Of 2)
Courtesy of VOLKSWAGEN OF AMERICA, INC.

Gear ratios

NOTE: The following list refers to items in Fig. 5 .

I - 1st gear

II - 2nd gear
III - 3rd gear
IV - 4th gear
V - 5th gear
R - Reverse gear
A - Final drive
T - Speedometer drive

Arrows point in direction of travel

Transmission	Code letters		EFB	ECV	FDB
Ratios	1st gear		2.714	2.714	2.714
	2nd gear		1.441	1.551	1.441
	3rd gear		1.000	1.000	1.000
	4th gear		0.742	0.679	0.742
	Reverse gear		2.884	2.111	2.884
Intermediate drive	No. of teeth	Input gear	45	61	45
		Output gear	44	63	44
	Ratio		0.978	1.033	0.978
Final drive	No. of teeth	Drive pinion	15	16	20
		Ring gear	68	78	74
	Ratio		4.533	4.875	3.700
Drive shaft	Flange dia. mm		Triple roller	Triple roller	Triple roller
ATF cooler	Equipment		Pressure-side 6-row	Pressure-side 6-row	Pressure-side 6-row

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Fig. 5: Identifying Transmission Layout (2 Of 2)

Courtesy of VOLKSWAGEN OF AMERICA, INC.

CALCULATING OVERALL RATIO "I"

Example:

CALCULATING OVERALL RATIO "i" (EXAMPLE)

Gear	5th gear	Final drive
Driving gear	$ZG_1 = 43$	$ZA_1 = 17$
Driven gear	$ZG_2 = 36$	$ZA_2 = 72$

i= Z_2 "DIVIDE" Z_1[1])

I_G =Gear ratio = ZG_2 / ZG_1 =36 / 43 = 0.837

I_A = Final drive ratio = ZA_2 / ZA_1 = 72 / 17 = 4.235

i = Total ratio

= I_G x I_A = 0.837 x 4.235 = 3.545

[1)] Z_1 = No. of teeth driving gear, Z_2 = No. of teeth driven gear

GENERAL REPAIR INSTRUCTIONS

To ensure perfect transmission repairs, the greatest care and cleanliness as well as the use of good and proper tools is essential. Obviously, the basis rules for safety are also applicable during repair work.

A number of generally valid instructions applicable for the various repair procedures - which were previously repeated a number of times at numerous places in the Repair Manual - are summarized here. They apply to this Repair Manual.

Transmission

- When installing make sure that the dowel sleeves between the engine and transmission are correctly located.
- When changing a transmission fill with gear oil to the lower edge of the filler hole.
- Capacities and specifications. See **CODE LETTERS, TRANSMISSION APPLICATION, RATIOS, CAPACITIES** .

NOTE:

- **If the oil level is topped off with the transmission installed, carry out oil level check as follows:**

- **Fill with oil to the lower edge of the filler hole and install filler plug. Start the engine, engage a gear and allow transmission to turn for approx. 2 minutes. Switch off engine and again top off oil to lower edge of filler hole.**

Gaskets, sealing rings

- Thoroughly clean joint surfaces and apply sealant AMV 188 200 03.
- Apply sealant uniformly but not too thick.
- Replace "O-rings".
- Radial shaft oil seals.

Before installation:

- Lightly oil outer edge, fill space between sealing lips -arrow-with grease G 052 128 A1.

Automatic transmission			01M					
Transmission	Code letters		ELU		ELT		ELY	
	Manufactured	from	05.99		05.99		05.99	
		to	12.99		12.99		12.99	
Torque converter For turbine shaft with sleeve see TORQUE CONVERTER IDENTIFICATION	Code letters		QCDC		QCDC		QBDC	
For turbine shaft without sleeve bearing see TORQUE CONVERTER IDENTIFICATION			QCDD		QCDD		QBDD	
Valve body	Code letters		QFB		QFB		QFB	
	Manufactured	from	03.00		03.00		03.00	
		to						
Number of plates			Inner	Outer	Inner	Outer	Inner	Outer
	Clutch -K1-		5	5	5	5	5	5
	Clutch -K2-		5	5	5	5	4	4
	Clutch -K3-		6	5	6	5	5	4
	Brake -B1-		6	6	5	5	5	5
	Brake -B2-		5	6	5	6	4	5
Application	Model		New Beetle 1998		New Beetle 1998		New Beetle 1998	
	Engine		1.8 ltr. - 110 kW		1.9 ltr. - 66 kW TDI		2.0 ltr. - 85 kW	

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Fig. 6: Identifying Oil Seal Lip
Courtesy of VOLKSWAGEN OF AMERICA, INC.

After installation:

Check transmission oil; if necessary top-off to lower edge of oil filler hole, specification. See **CODE LETTERS, TRANSMISSION APPLICATION, RATIOS, CAPACITIES** .

Locking devices

- Replace circlips.
- Do not overstretch circlips.
- Circlips must be install properly in the groove.
- Replace spring pins. Installation position: Slot longitudinal to line of force.

Transmission	Code letters		ELU	ELT	ELY
Ratios	1st gear		2.714	2.714	2.714
	2nd gear		1.441	1.441	1.551
	3rd gear		1.000	1.000	1.000
	4th gear		0.742	0.742	0.679
	Reverse gear		2.884	2.884	2.111
Intermediate drive	No. of teeth	Input gear	45	45	61
		Output gear	44	44	63
	Ratio		0.978	0.978	1.033
Final drive	No. of teeth	Drive pinion	15	20	16
		Ring gear	68	74	78
	Ratio		4.533	3.700	4.875
Drive shaft	Flange dia. mm		Triple roller	Triple roller	Triple roller
ATF cooler	Equipment		Pressure-side 6-row	Pressure-side 6-row	Pressure-side 6-row

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Fig. 7: Replacing Circlips
Courtesy of VOLKSWAGEN OF AMERICA, INC.

Bolts and nuts

- Tighten and loosen bolts and nuts for securing covers and housings in a diagonal sequence.
- Delicate parts, must not be distorted, such as clutch pressure plates. Loosen and tighten nuts and bolts in

stages in a diagonal sequence.

- Tightening torques as specified are for unoiled bolts and nuts.
- Replace self-locking bolts and nuts.
- Make sure with threaded connections that the areas of the contact surfaces as well as the visible surfaces of nuts and bolts are rewaxed after assembly.

Bearings

- Install new tapered roller bearings as supplied and do not lubricate.
- Install needle bearings with lettered side (thicker metal) toward installing tool.
- Tapered roller bearings installed to one shaft must be replaced as a set. Use same make of bearings.
- Heat inner races to approx. 100 °C before installing.

Shims

- Measure shims at several points with a micrometer. Tolerance variations make it possible to find the exact shim thickness required.
- Check for burrs and damage.
- Only install perfect shims.

Synchronizer rings

- Do not interchange. When reusing always install to the same gear.
- Check for wear and replace if necessary.
- Coat with gear oil before installing.

Gear wheels

- Before installing clean and heat on a hot plate to approx. 100° C.
- Temperature can be checked with temperature tester V.A.G 1558.

MANUAL TRANSMISSION - CONTROLS, HOUSING

TRANSMISSION, DISASSEMBLING AND ASSEMBLING

Transmission overview

NOTE: The following list refers to items in Fig. 8 .

1. **1st gear**
2. **2nd gear**
3. **3rd gear**
4. **4th gear**

5. **5th gear**
6. **Transmission housing**
    - Servicing. See **TRANSMISSION HOUSING AND CLUTCH HOUSING, SERVICING**
7. **Selector mechanism**
    - (Selector forks)
    - Disassembling and assembling. See **SELECTOR FORKS, DISASSEMBLING AND ASSEMBLING**
8. **Input gear for 1st and reverse gear**
9. **Input shaft**
    - Disassembling and assembling. See **INPUT SHAFT, DISASSEMBLING AND ASSEMBLING**
10. **Output shaft**
    - Disassembling and assembling. See **Output shaft, disassembling and assembling**
11. **Differential**
    - Disassembling and assembling. See **Differential, disassembling and assembling**
12. **Clutch housing**
    - Servicing. See **TRANSMISSION HOUSING AND CLUTCH HOUSING, SERVICING**

Automatic transmission		01M					
Transmission	Codes	ELZ		EPB		EPC	
	Manufactured from	05.99		12.99		12.99	
	to	12.99		03.00		02.00	
Torque converter	Codes	QBDC		QCDD		QCDD	
Valve body	Code letters	QFB		QFB		QFB	
	Manufactured from	03.00		03.00		03.00	
	to						
Number of plates		Inner	Outer	Inner	Outer	Inner	Outer
	Clutch -K1-	5	5	5	5	5	5
	Clutch -K2-	4	4	5	5	5	5
	Clutch -K3-	5	4	6	5	6	5
	Brake -B1-	5	5	5	5	6	6
	Brake -B2-	4	5	5	6	5	6
Application	Model	New Beetle 1998		New Beetle 1998		New Beetle 1998	
	Engine	2.0 ltr. - 85 kW		1.9 ltr. - 66 kW TDI		1.8 ltr. - 110 kW	

G00389945

Fig. 8: Sectional View Of O2J Transmission
Courtesy of VOLKSWAGEN OF AMERICA, INC.

Assembly overview

NOTE: The following list refers to items in Fig. 9 .

I. **Removing and installing cover for transmission housing and 5th gear. See COVER FOR TRANSMISSION HOUSING AND 5TH GEAR, REMOVING AND INSTALLING**
II. **Disassembling and assembling transmission housing and shift mechanism. See TRANSMISSION HOUSING AND SELECTOR MECHANISM, REMOVING AND INSTALLING**
III. **Disassembling and assembling input shaft, output shaft, differential and selector forks. See INPUT**

SHAFT, OUTPUT SHAFT (PINION SHAFT), DIFFERENTIAL AND SELECTOR FORKS, REMOVING AND INSTALLING

Transmission	Codes		ELZ	EPB	EPC
Ratios	1st gear		2.714	2.714	2.714
	2nd gear		1.441	1.441	1.441
	3rd gear		1.000	1.000	1.000
	4th gear		0.742	0.742	0.742
	Reverse gear		2.884	2.884	2.884
Intermediate drive	No. of teeth	Input gear	45	45	45
		Output gear	44	44	44
	Ratio		0.978	0.978	0.978
Final drive	No. of teeth	Drive pinion	15	20	15
		Ring gear	68	74	68
	Ratio		4.533	3.700	4.533
Drive shaft	Flange dia. mm		Triple roller	Triple roller	Triple roller
ATF cooler	Equipment		Pressure-side 6-row	Pressure-side 6-row	Pressure-side 6-row

G00389946

Fig. 9: Identifying Assembly Overview
Courtesy of VOLKSWAGEN OF AMERICA, INC.

Cover for transmission housing and 5th gear, removing and installing

NOTE: The following list refers to items in Fig. 10 .

1. **Hex bolt, 10 N.m**
   - For transmission housing cover
2. **Transmission housing cover**

NOTE: **If the transmission cover is installed with the transmission installed, check oil level as follows:**

- **Fill with oil to lower edge of filler hole and install filler plug.**
- **Start engine, engage gear and allow transmission to turn for approx. 2 minutes.**
- **Switch off engine and top off transmission oil to lower edge of filler hole again.**

3. **Gasket**
4. **5Torx socket head bolt M10, 80 N.m**
   - Install piece on bolt head holds saucer spring washer in position
5. **Dished spring**
   - Installing. See **INSTALLATION POSITION OF DISHED SPRING FOR GEAR WHEEL AND 5TH GEAR SYNCHRO-HUB SECURING BOLTS:**
6. **Socket head bolt, 25 N.m**
   - For pivot pin to transmission housing
7. **Pivot pin**
8. **5th gear selector fork**
   - Disassembling and assembling. See **SELECTOR FORKS, DISASSEMBLING AND ASSEMBLING**
   - Adjusting. See **ADJUSTING 5TH GEAR:**
9. **5th gear locking collar**
   - Installation position. See **CHECKING 5TH GEAR SYNCHRO-RING**
   - Adjusting. See **ADJUSTING 5TH GEAR:**
10. **Synchro-hub with 5th gear and synchronizing ring**
    - Disassembling and assembling. See **5th gear synchronizer**
11. **Needle roller bearing**
12. **5th speed gear wheel**
    - Installation position. See **INSTALLATION POSITION 5TH GEAR WHEEL**

Automatic transmission		01M					
Transmission	Codes	FDC		FDF		FDG	
	Manufactured from to	02.00		02.00		02.00	
Torque converter	Codes	QCDD		QBDD		QBDD	
Valve body	Code letters	QFB		QFB		QFB	
	Manufactured from to	03.00		03.00		03.00	
Number of plates		Inner	Outer	Inner	Outer	Inner	Outer
	Clutch -K1-	5	5	5	5	5	5
	Clutch -K2-	5	5	4	4	4	4
	Clutch -K3-	6	5	5	4	5	4
	Brake -B1-	6	6	5	5	5	5
	Brake -B2-	5	6	4	5	4	5
Application	Model	New Beetle 1998		New Beetle 1998		New Beetle 1998	
	Engine	1.8 ltr. - 110 kW		2.0 ltr. - 85 kW		2.0 ltr. - 85 kW	

G00389947

Fig. 10: Exploded View Of Transmission Housing Cover
Courtesy of VOLKSWAGEN OF AMERICA, INC.

Transmission housing and selector mechanism, removing and installing

NOTE: The following list refers to items in Fig. 11 .

1. **Cone head bolt, 25 N.m**
2. **Flange shaft with spring**
   - Removing and installing. See **ASSEMBLY SEQUENCE**
   - Complement. See item 19 Flange Shaft
3. **Torx socket head bolt, 30 N.m**
   - For reverse shaft support

- Self-locking
- Always replace

4. **O-ring**
    - Always replace
5. **Pivot pin**
6. **Bolt, 25 N.m**
7. **Bolt, 25 N.m**
8. **Cover plate**
9. **Transmission housing**
    - Servicing. See **TRANSMISSION HOUSING AND CLUTCH HOUSING, SERVICING**
10. **Clutch housing**
    - Servicing. See **TRANSMISSION HOUSING AND CLUTCH HOUSING, SERVICING**
11. **Hex bolt, 25 N.m then turn 90° further**
12. **Selector mechanism**
    - Disassembling and assembling on vehicles up to 05.99. See **SELECTOR MECHANISM ON TRANSMISSION SIDE, UP TO 05.99, DISASSEMBLING AND ASSEMBLING**
    - Disassembling and assembling on vehicles as of 06.99. See **SELECTOR MECHANISM ON TRANSMISSION SIDE, AS OF 06.99, DISASSEMBLING AND ASSEMBLING**
13. **Hex bolt, 25 N.m**

Transmission	Codes		FDC	FDF	FDG
Ratios	1st gear		2.714	2.714	2.714
	2nd gear		1.441	1.551	1.441
	3rd gear		1.000	1.000	1.000
	4th gear		0.742	0.679	0.742
	Reverse gear		2.884	2.111	2.884
Intermediate drive	No. of teeth	Input gear	45	61	45
		Output gear	44	63	44
	Ratio		0.978	1.033	0.978
Final drive	No. of teeth	Pinion shaft	15	16	15
		Ring gear	68	78	68
	Ratio		4.533	4.875	4.533
Drive shaft	Flange dia. mm		Triple roller	Triple roller	Triple roller
ATF cooler	Equipment		Pressure-side 6-row	Pressure-side 6-row	Pressure-side 6-row

G00389948

Fig. 11: Exploded View Of Transmission Housing And Selector Mechanism
Courtesy of VOLKSWAGEN OF AMERICA, INC.

Input shaft, output shaft (pinion shaft), differential and selector forks, removing and installing

NOTE: The following list refers to items in Fig. 12 .

1. **Differential**
   - Disassembling and assembling. See **Differential, disassembling and assembling**
2. **Oil seal**
   - Qty. 4

- Always replace

3. **Output shaft**
   - Disassembling and assembling. See **Output shaft, disassembling and assembling**
4. **Reverse shaft support**
   - Disassembling and assembling. See item6 Reverse Shaft
5. **Reverse shaft**
   - Disassembling and assembling. See **Reverse shaft, disassembling and assembling**
6. **Input shaft**
   - Disassembling and assembling. See **INPUT SHAFT, DISASSEMBLING AND ASSEMBLING**
7. **Reverse gear selector fork**
   - Disassembling and assembling. See **SELECTOR FORKS, DISASSEMBLING AND ASSEMBLING**
   - Installation position. See **ASSEMBLING**
8. **Torx socket head bolt, 25 N.m**
9. **Selector mechanism**
   - (Selector forks)
   - Disassembling and assembling. See **SELECTOR FORKS, DISASSEMBLING AND ASSEMBLING**
10. **Clutch housing**
    - Servicing. See **TRANSMISSION HOUSING AND CLUTCH HOUSING, SERVICING**
11. **Hex nut, 25 N.m and then turn 90° further**
    - 4 nuts for bearing support
12. **Flange shaft with spring**
    - Removing and installing. See **ASSEMBLY SEQUENCE**
    - Assembling. See item 19 Flange Shaft
13. **Cone head bolt, 25 N.m**

Automatic transmission		01M					
Transmission	Codes	EPG		EPH		EPP	
	Manufactured from	12.99		12.99		12.99	
	to	02.00		02.00			
Torque converter	Codes	QBDD		QBDD		QCDD	
Valve body	Codes	QFB		QFB		QFA	
	Manufactured from	03.00		03.00		03.00	
	to						
Number of plates		Inner	Outer	Inner	Outer	Inner	Outer
	Clutch -K1-	5	5	5	5	5	5
	Clutch -K2-	4	4	4	4	5	5
	Clutch -K3-	5	4	5	4	6	5
	Brake -B1-	5	5	5	5	5	5
	Brake -B2-	4	5	4	5	5	6
Application	Model	New Beetle 1998		New Beetle 1998		New Beetle 1998	
	Engine	2.0 ltr. - 85 kW		2.0 ltr. - 85 kW		1.9 ltr. - 66 kW TDI	

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Fig. 12: Identifying Input Shaft, Output Shaft (Pinion Shaft), Differential And Selector Forks
Courtesy of VOLKSWAGEN OF AMERICA, INC.

Disassembling and assembling transmission housing cover, transmission housing, selector mechanism, input shaft, output shaft (pinion shaft), differential and selector forks

Special tools and equipment

- VW 309 Holding plate
- VW 353 Transmission support
- VW 295 Drift
- VW 244 B Fitting sleeve

- VAG 1416 Hot air blower

Transmission	Codes		EPG	EPH	EPP
Ratios	1st gear		2.714	2.714	2.714
	2nd gear		1.551	1.441	1.441
	3rd gear		1.000	1.000	1.000
	4th gear		0.679	0.742	0.742
	Reverse gear		2.111	2.884	2.884
Intermediate drive	No. of teeth	Input gear	61	45	45
		Output gear	63	44	44
	Ratio		1.033	0.978	0.978
Final drive	No. of teeth	Pinion shaft	16	15	22
		Ring gear	78	68	72
	Ratio		4.875	4.533	3.273
Drive shaft	Flange dia. mm		Triple roller	Triple roller	Triple roller
ATF cooler	Equipment		Pressure side 6-row	Pressure side 6-row	Pressure side 6-row

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Fig. 13: Identifying Special Tools And Equipment
Courtesy of VOLKSWAGEN OF AMERICA, INC.

Disassembling

- Mount transmission on repair stand.

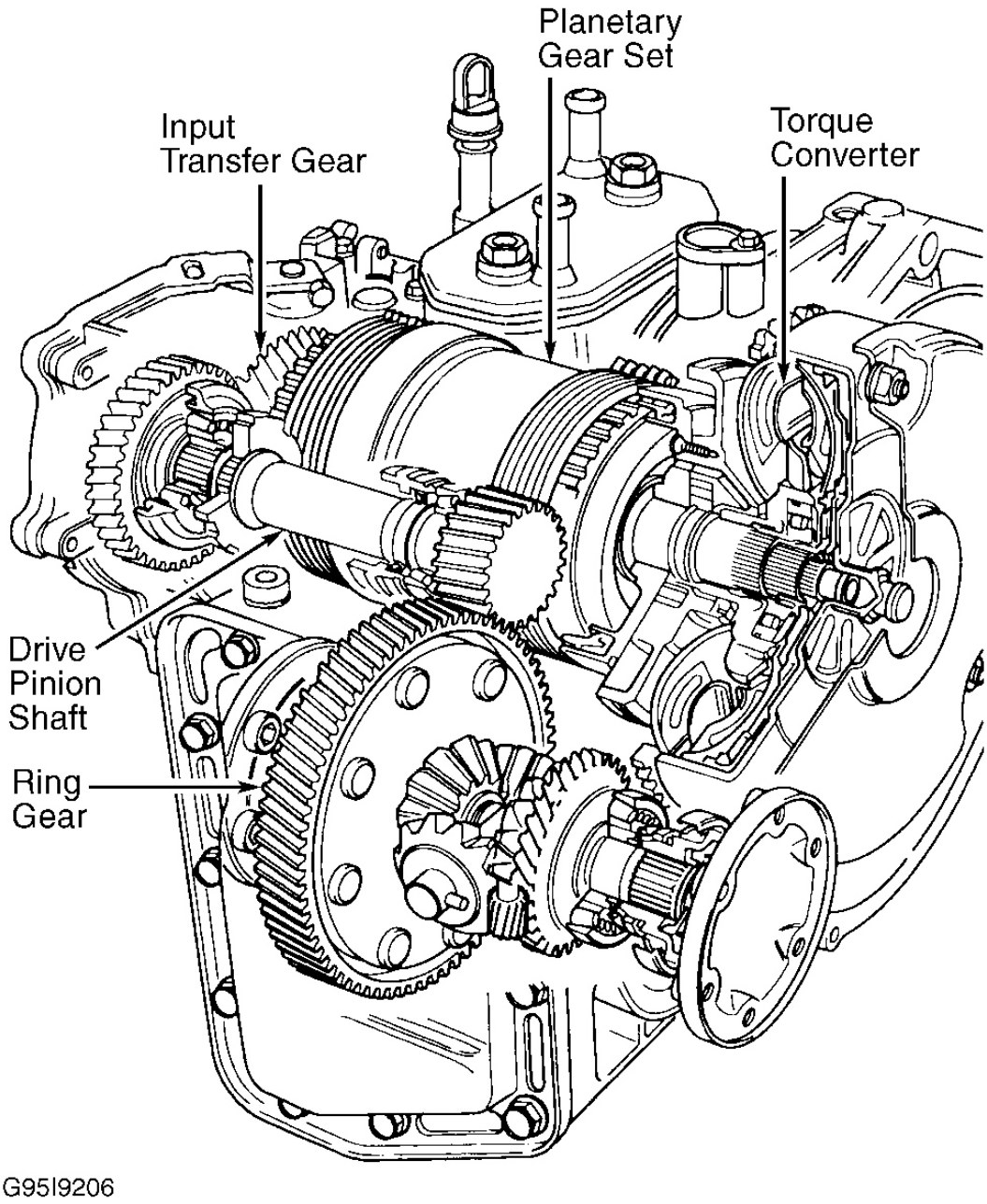
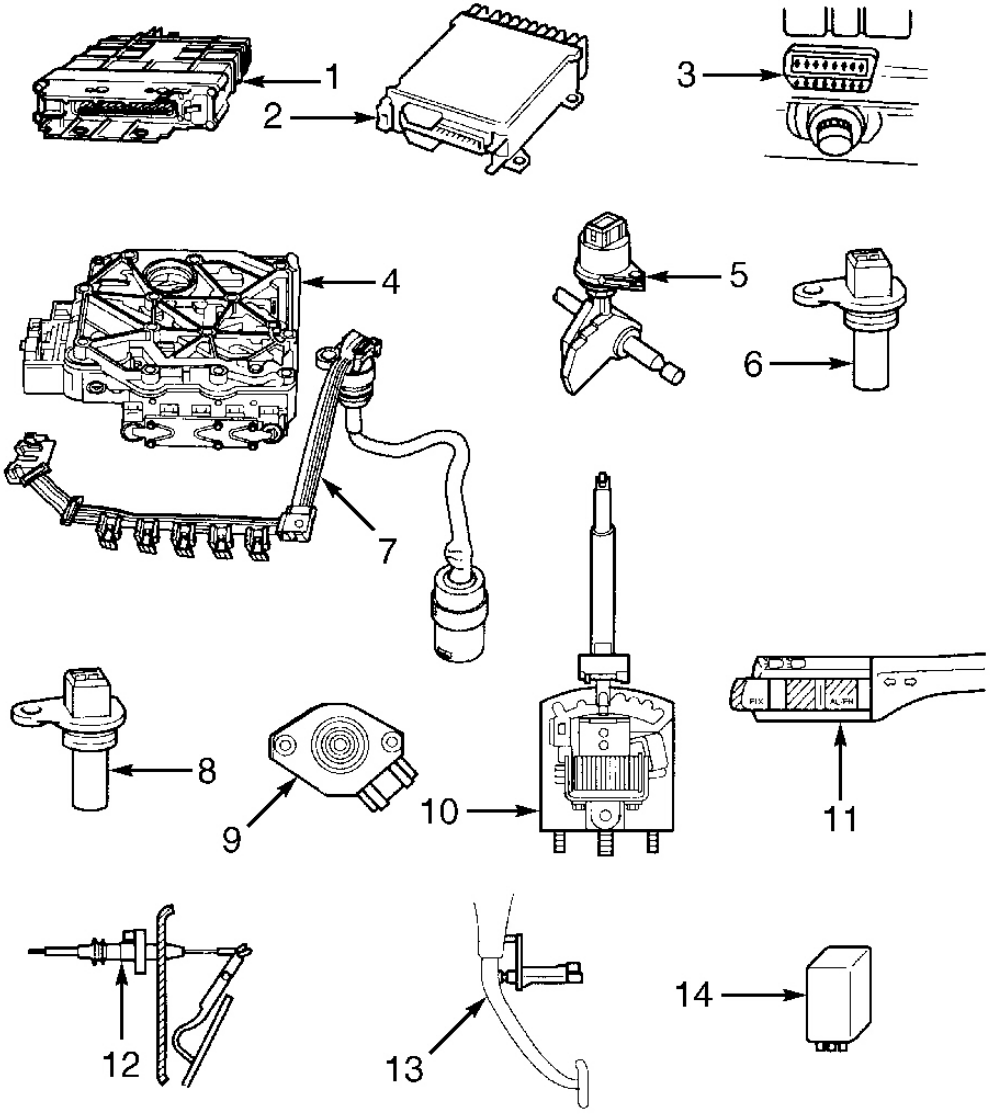


Fig. 14: Mounting Transmission On Repair Stand
Courtesy of VOLKSWAGEN OF AMERICA, INC.

- Drain transmission oil.
- Remove clutch release lever and release bearing. See **CLUTCH RELEASE BEARING** .
- Remove guide sleeve. See **CLUTCH RELEASE BEARING** .

- Remove transmission housing cover (arrow).



1. Transmission Control Module (TCM)
2. Powertrain Control Module (PCM)
3. Data Link Connector (DLC)
4. Valve Body
5. Transmission Range (TR) Switch
6. Transmission Vehicle Speed Sensor (VSS)
7. Conductor Strip (With Integrated Transmission Fluid Temperature Sensor)
8. Vehicle Speed Sensor (VSS)
9. Throttle Position (TP) Sensor
10. Shift Lock Solenoid
11. Cruise Control Solenoid
12. Kickdown Switch
13. Brakelight Switch
14. Park/Neutral Position Relay

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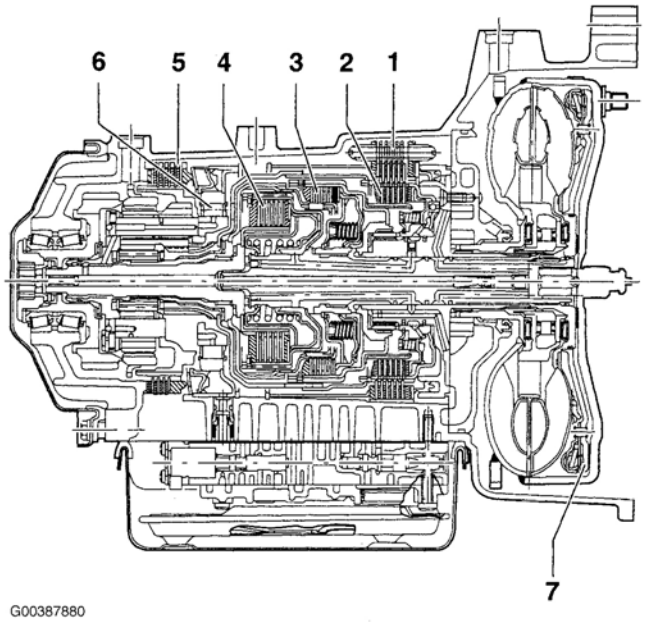
Fig. 15: Removing Transmission Housing Cover
Courtesy of VOLKSWAGEN OF AMERICA, INC.

- Remove 5th gear selector fork (arrow)



1 = 2nd and 4th gear brake -B2-

2 = Reverse gear clutch -K2-

3 = 1st to 3rd gear clutch -K1-

4 = 3rd and 4th gear clutch -K3-

5 = Reverse gear brake -B1-

6 = Free wheel clutch

7 = Lock-up clutch integrated in torque converter -LC-

Fig. 16: Removing 5th Gear Selector Fork
Courtesy of VOLKSWAGEN OF AMERICA, INC.

- Remove spring for locking piece.
- Remove locking collar and take off locking piece.
- Slide locking collar, without selector fork, over synchro-hub again.
- Remove bolts -A- for synchro-hub and 5th gear, to do this select 5th (arrow -1-) and 1st gear (arrows -2- and -3-).

Gear	B1	B2	K1	K2	K3	F	LC
R	X			X			
1H			X			X	
1M			X			X	X
2H		X	X				
2M		X	X				X
3H			X		X		
3M			X		X		X
4H		X			X		
4M		X			X		X

X = clutches, brakes or freewheel engaged

H = hydraulic

M = mechanical

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Fig. 17: Removing Synchro-Hub And 5th Gear
Courtesy of VOLKSWAGEN OF AMERICA, INC.

- After engaging both gears input shaft and output shaft are locked, synchro-hub and gear wheel cannot turn. Both bolts can now be loosened.
- Take off locking collar.
- Pull off synchro-hub and 5th gear wheel and remove together with needle roller bearing.

A. Two arm puller e.g. Kukko 20/10 with Matra V/170 hooks.
B. Hex bolt M10 x 20

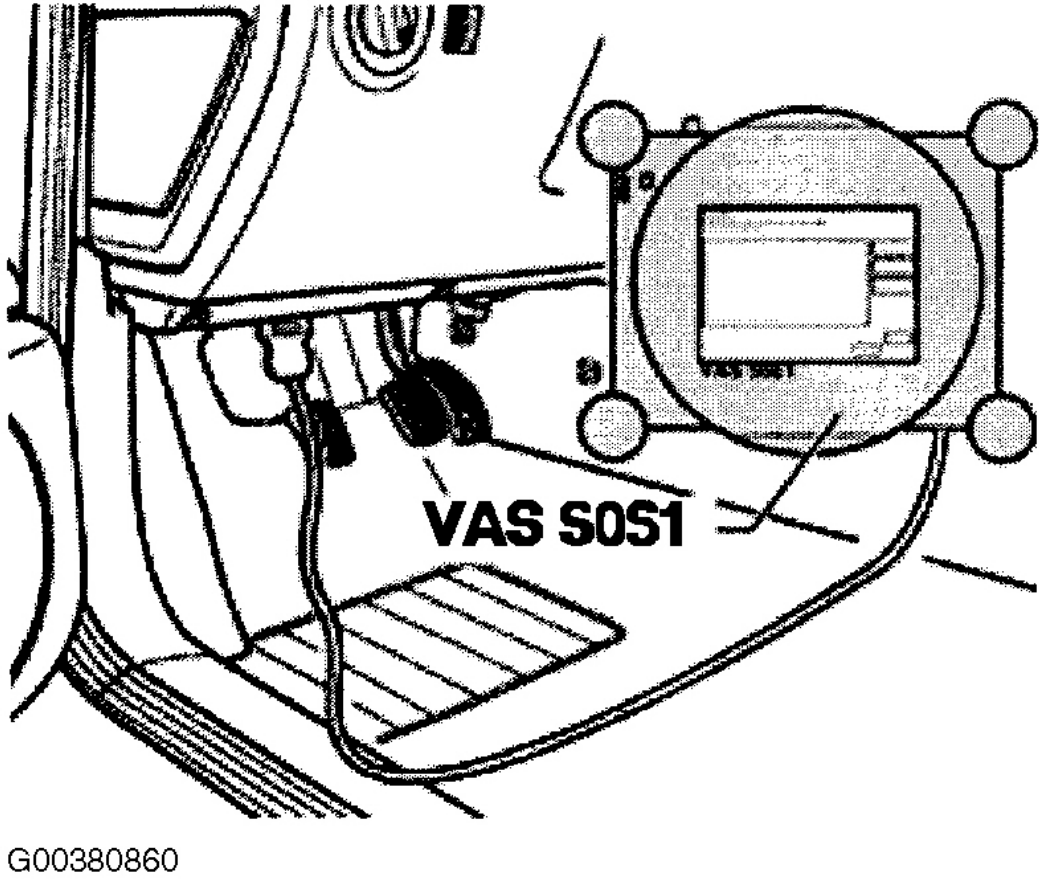

Fig. 18: Removing Synchro-Hub And 5th Gear Wheel With Needle Roller Bearing
Courtesy of VOLKSWAGEN OF AMERICA, INC.

- Pull off 5th gear wheel
  A. Two arm puller e.g. Kukko 20/10 with Matra V/170 hooks.
  B. Hex bolt M10 x 20

Sequence for removing:

- Install two arm puller and centralize by turning screw (arrow).
- Heat gear wheel with hot air blower VAG 1416 and pull off.

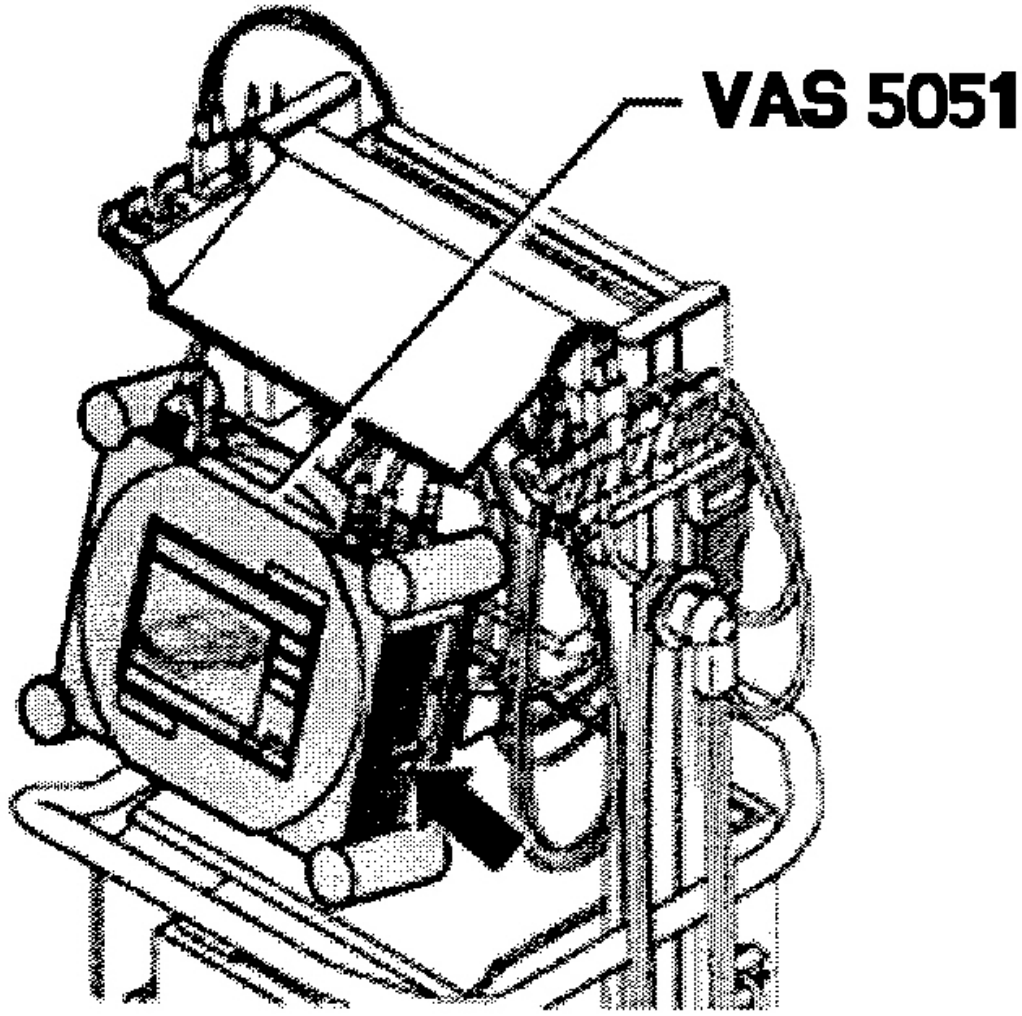

Fig. 19: Removing 5th Gear Wheel
Courtesy of VOLKSWAGEN OF AMERICA, INC.

NOTE: When pulling off the gear wheel make sure that the hooks do not bend outward, if necessary tighten screw (arrow). After 5th gear wheel has been removed check for damage.

- Remove both flange shafts.

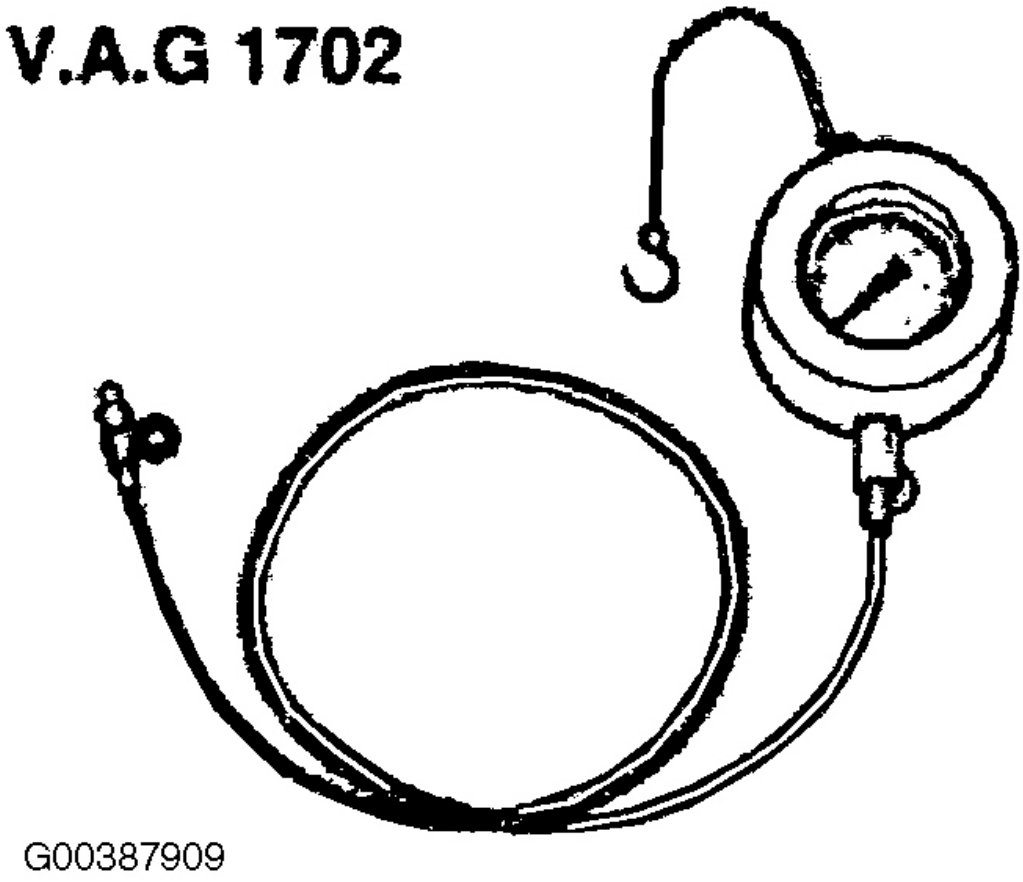

Fig. 20: Removing Flange Shafts
Courtesy of VOLKSWAGEN OF AMERICA, INC.

- Take out flange shafts along with springs, thrust washers and tapered rings.
- Remove both reverse shaft support bracket bolts (arrows).

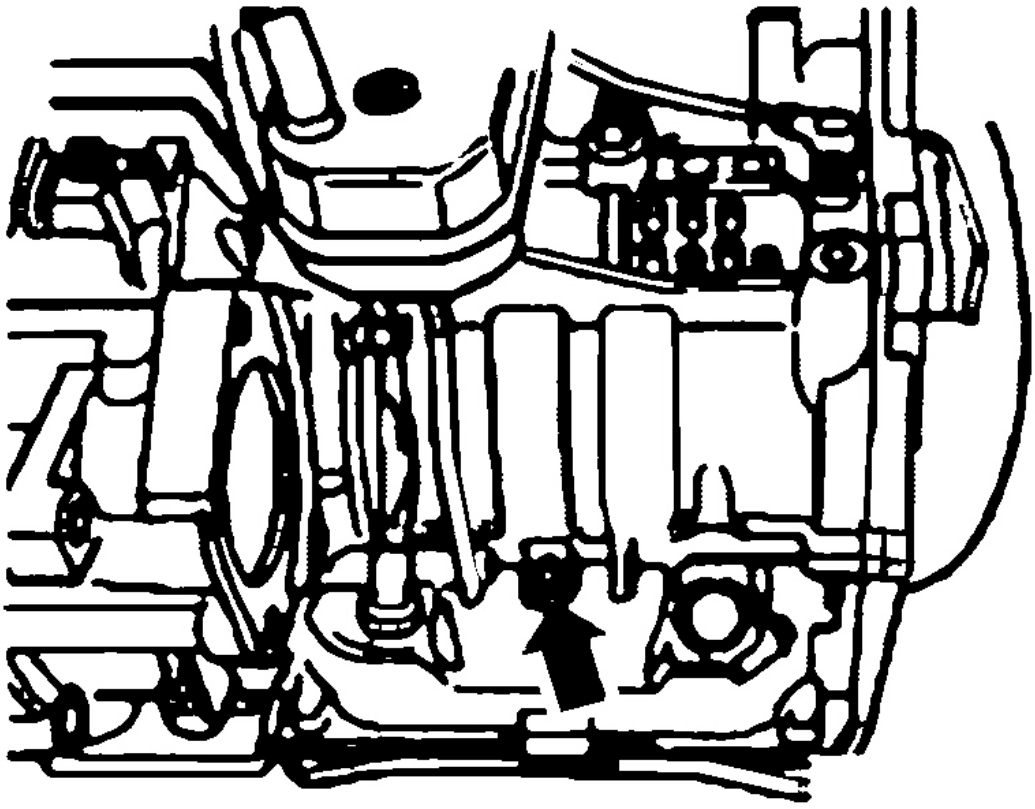

Fig. 21: Removing Reverse Shaft Support Bracket
Courtesy of VOLKSWAGEN OF AMERICA, INC.

Transmissions up to 05.99

- Remove selector shaft with selector mechanism cover; to do this place selector shaft in neutral position. Then remove bolts (arrows) and pull selector shaft out of transmission housing.

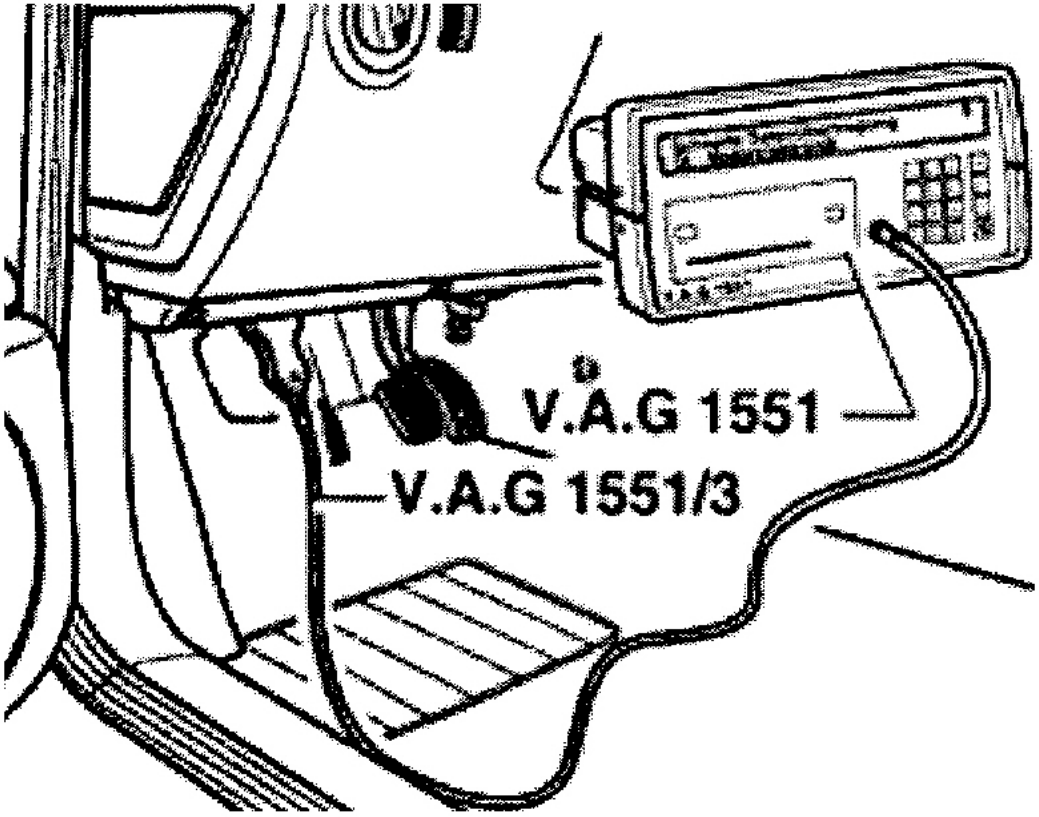

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Fig. 22: Removing Selector Shaft Out Of Transmission Housing
Courtesy of VOLKSWAGEN OF AMERICA, INC.

Transmissions as of 06.99

- Remove selector shaft with selector mechanism cover; to do this place selector shaft in neutral position. Then remove bolts -arrows- and pull selector shaft out of transmission housing.

	Selector lever positions	
	D Idle	R Idle
Pressure in bar	3.4 to 3.8	5 to 6

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Fig. 23: Removing Selector Shaft With Selector Mechanism Cover
Courtesy of VOLKSWAGEN OF AMERICA, INC.

Continuation for all vehicles

- Remove cover plate -A- and pivot pins -B- from underside of transmission.

Possible causes	Remedy
Idling speed too high	Adjust engine
ATF pump faulty	Check ATF pump and replace if necessary
Sticking valves in valve body	Replace valve body

G00387912

Fig. 24: Removing Cover Plate And Pivot Pins From Underside Of Transmission
Courtesy of VOLKSWAGEN OF AMERICA, INC.

- Remove pivot pins -A- on top side of transmission and transmission housing to clutch housing securing bolts -B- in area of differential.

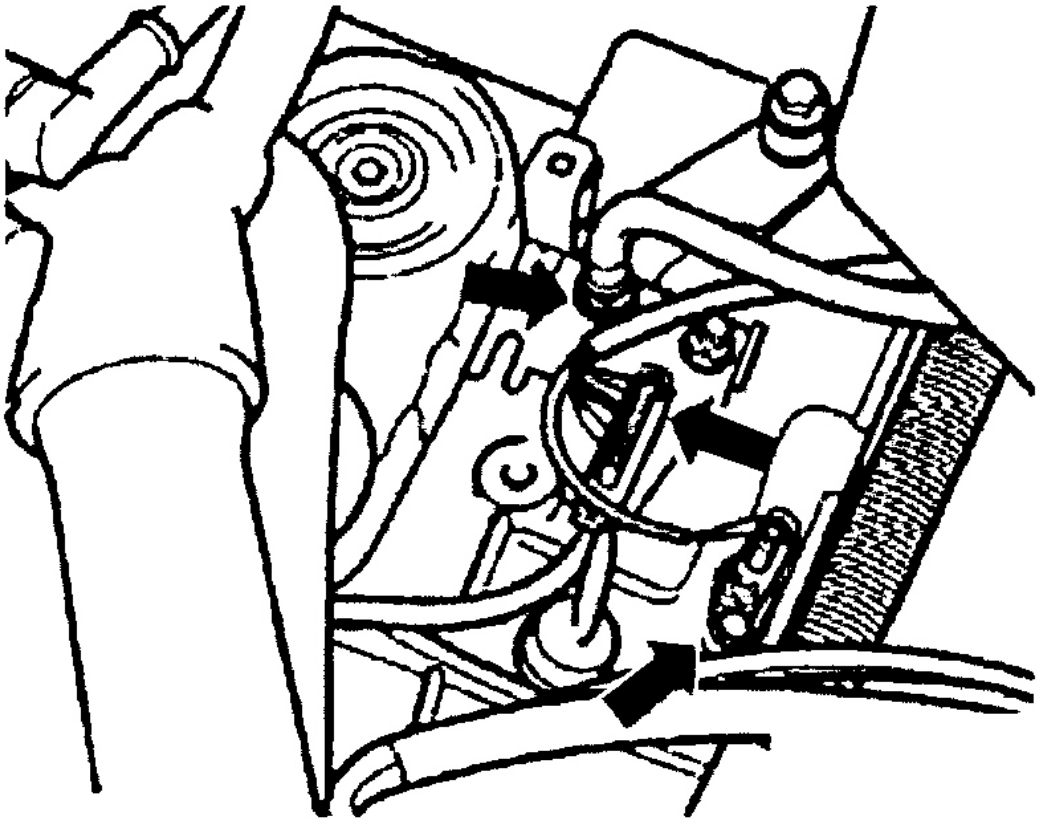

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Fig. 25: Removing Top Side Of Transmission And Transmission Housing To Clutch Housing
Courtesy of VOLKSWAGEN OF AMERICA, INC.

- Remove bolts -A-, from inside clutch housing for securing clutch housing to transmission housing.

NOTE: Do not remove nuts -B- for output shaft bearing support.

	Selector lever positions and test conditions	
	D Engine speed ca. 2000 rpm	R Engine speed ca. 2000 rpm
Pressure in bar	12.4 to 13.2	23.0 to 24.0

G00387914

Fig. 26: Removing Inside Clutch Housing For Securing Clutch Housing To Transmission Housing
Courtesy of VOLKSWAGEN OF AMERICA, INC.

- Take off transmission housing, carefully pry up all round and alternating between sides on protruding housing flange (arrows). Be careful not to damage sealing surfaces.

Possible causes	Remedy
ATF pump faulty	Check ATF pump and replace if necessary
Sticking valves in valve body	Replace valve body

G00387915

Fig. 27: Removing Protruding Housing Flange
Courtesy of VOLKSWAGEN OF AMERICA, INC.

- Remove selector forks -A- together with selector plates.

- Unscrew bolt for selector mechanism for reverse gear -B-.

Work steps	completed?
Diagnostic Trouble Code (DTC) Memory: Check using VAS 5051 Tester in mode "Guided Fault Finding".	
Power windows (where applicable): Completely open and close all power windows.	
Radio: Input anti-theft radio code and check radio, CD & tape player functions as applicable.	
Clock: Check and reset to local time.	
All electrical consumers: Check function.	

G00387816

Fig. 28: Removing Selector Forks With Selector Plates
Courtesy of VOLKSWAGEN OF AMERICA, INC.

- Remove nuts for output shaft bearing support. See **ASSEMBLING** , item -B-
- Remove reverse gear -A-, input shaft -B- and output shaft -C- one after other from clutch housing.

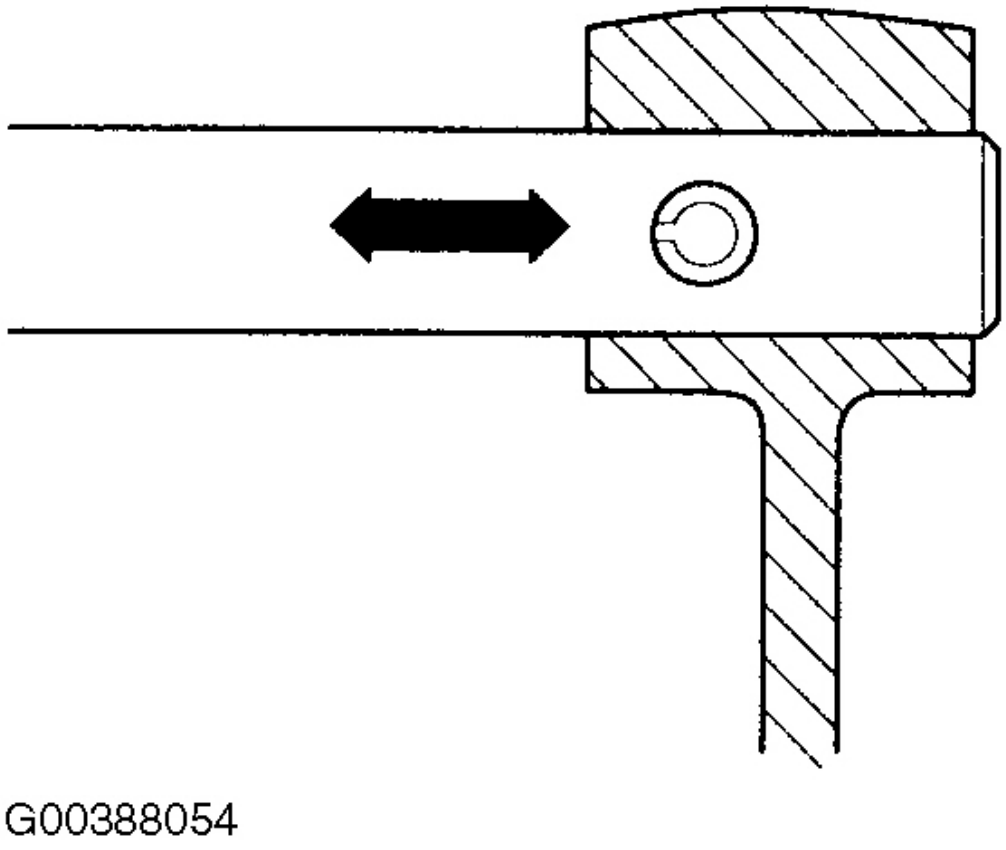

Fig. 29: Removing Reverse Gear, Input Shaft And Output Shaft From Clutch Housing
Courtesy of VOLKSWAGEN OF AMERICA, INC.

- Take out differential.

Assembling

- Install differential.
- Always replace sealing rings (arrows) for output shaft bearing support.

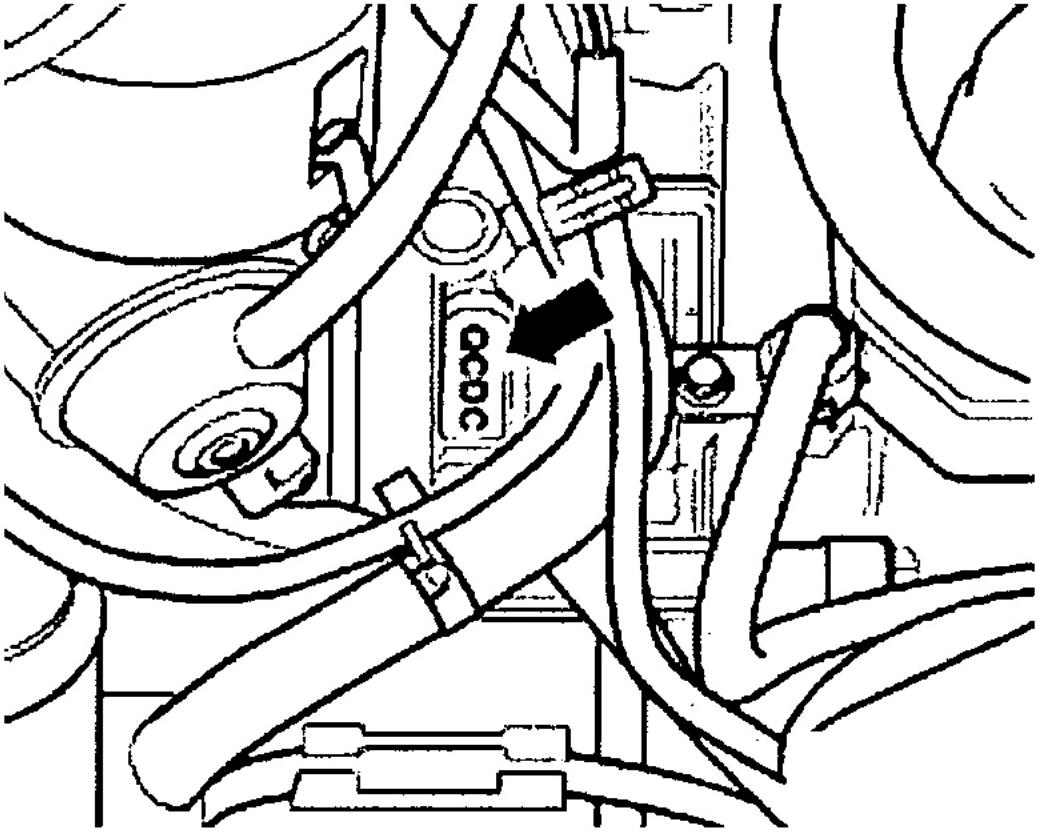

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Fig. 30: Installing Sealing Rings To Output Shaft Bearing Support
Courtesy of VOLKSWAGEN OF AMERICA, INC.

NOTE: The illustration only shows 3 of the 4 sealing rings.

- Install input shaft, output shaft and reverse shaft together.
- Tighten nuts for output shaft bearing support.
- Clean locking fluid remnants from threads in reverse shaft support. See **INSTALLATION POSITION 5TH GEAR WHEEL** . Remnants can be removed using a tap.
- Install reverse shaft support.
- Install selector mechanism/reverse gear.

Installation position reverse gear

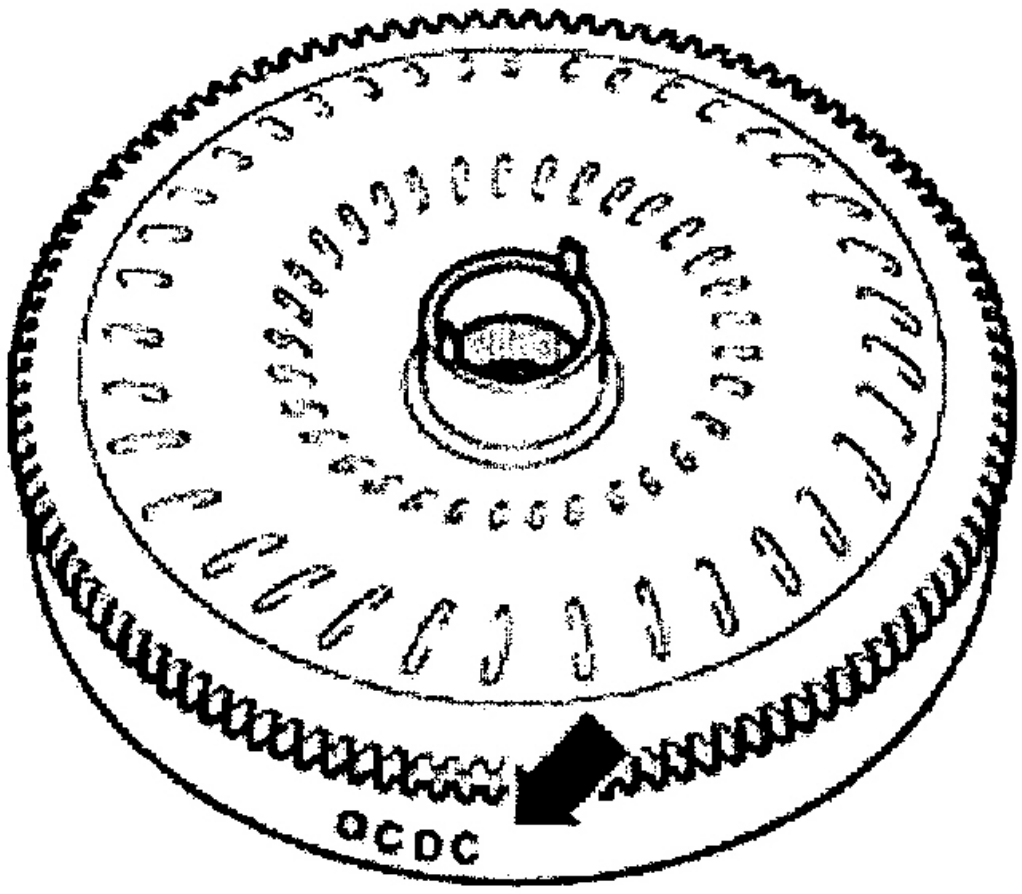

Fig. 31: Installation Position Reverse Gear
Courtesy of VOLKSWAGEN OF AMERICA, INC.

- Install selector forks together with selector plates.
- Screw M 8 x 100 mm studs -A- into reverse shaft support so that shaft is aligned after installing transmission housing.

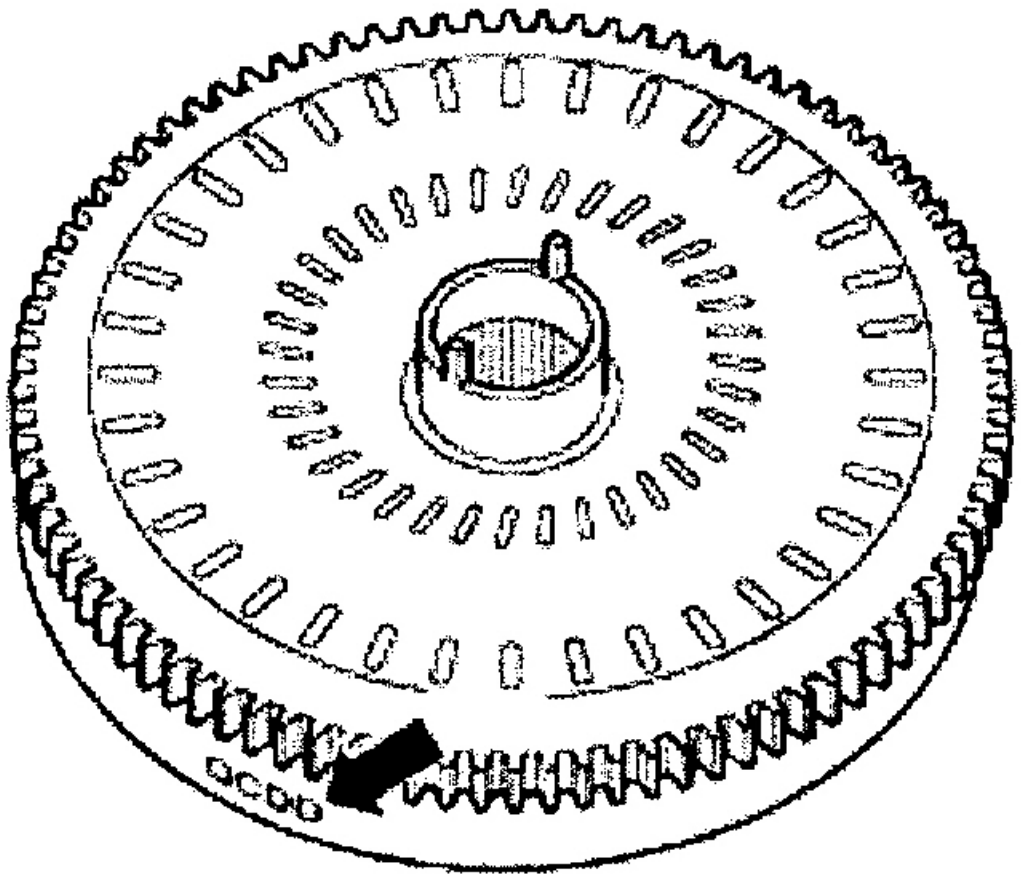

Fig. 32: Identifying Reverse Shaft Into Transmission Housing
Courtesy of VOLKSWAGEN OF AMERICA, INC.

- Align selector plates.

NOTE: The selector segments must be positioned in the grooves on the locking collars.

- Install transmission housing.

Install reverse shaft support bolts (arrow) as follows:

- Insert bolt -a-, remove stud (see Illustration V34-2s008), insert bolt -b- and hand tighten.

Tightening sequence:

1. Bolt -a- 30 N.m
2. Bolt -b- 30 N.m

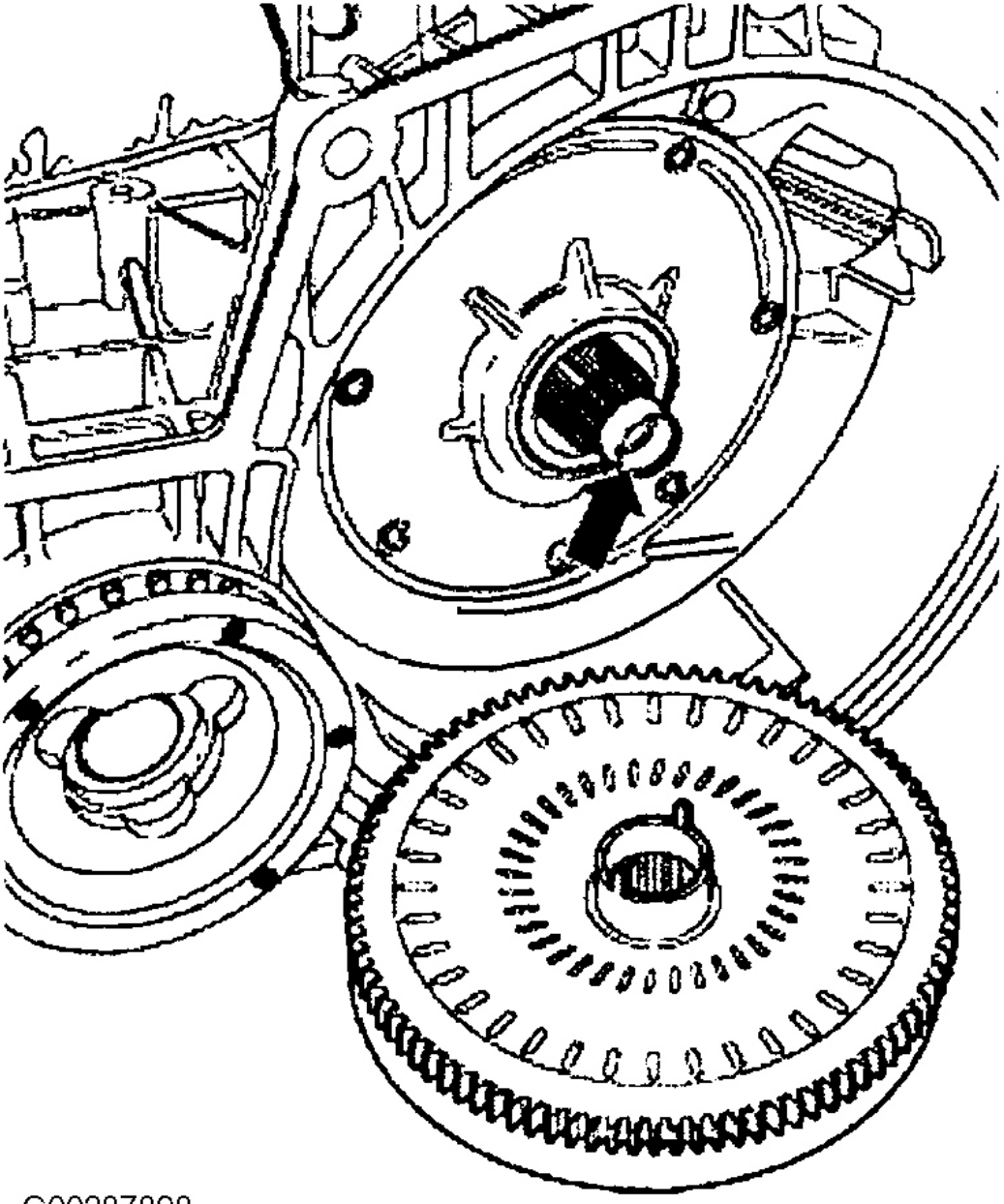

Fig. 33: Sectional View Of Gear Assembly

Courtesy of VOLKSWAGEN OF AMERICA, INC.

- Install pivot pin (arrow) for selector forks. To do this align selector mechanism with a screwdriver so that relevant pivot pin can be installed.

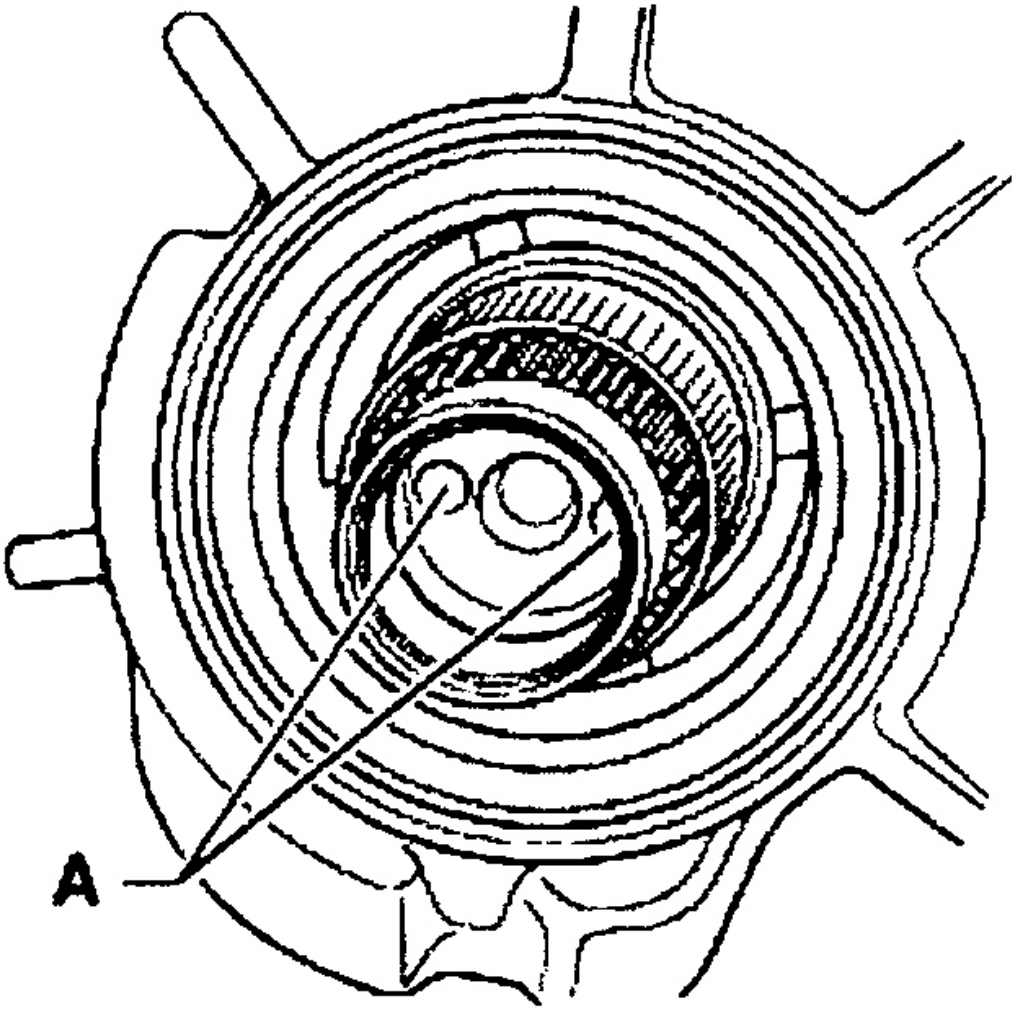

Fig. 34: Installing Pivot Pin
Courtesy of VOLKSWAGEN OF AMERICA, INC.

- Install selector shaft cover

Install selector shaft as follows:

- Place selector plates in neutral.
- Locate lug (arrow -1-) in recess in transmission housing. Position selector shaft so that selector finger (arrow -2-) is inserted in selector plates.

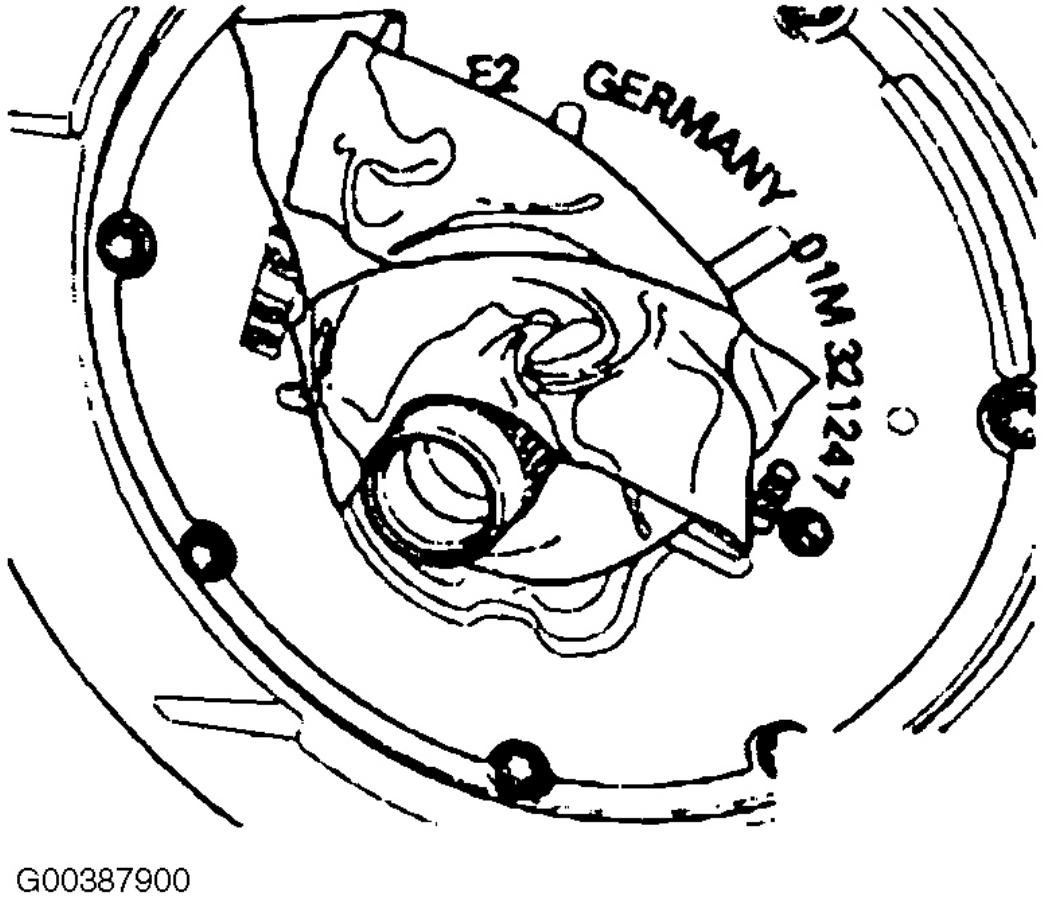

Fig. 35: Installing Selector Shaft
Courtesy of VOLKSWAGEN OF AMERICA, INC.

- Install selector shaft cover.

Installation position 5th gear wheel

The circumferential groove (arrow) faces to transmission housing.

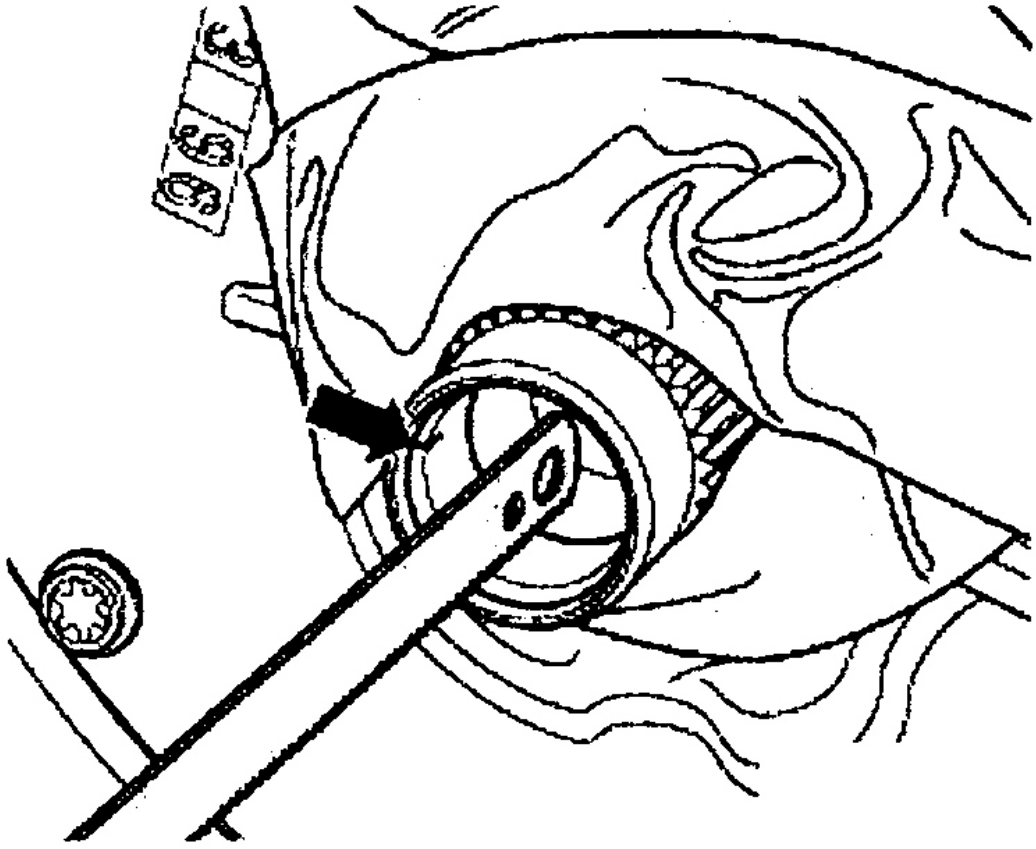

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Fig. 36: Identifying Installation Position 5th Gear Wheel
Courtesy of VOLKSWAGEN OF AMERICA, INC.

- Drive on 5th gear wheel.

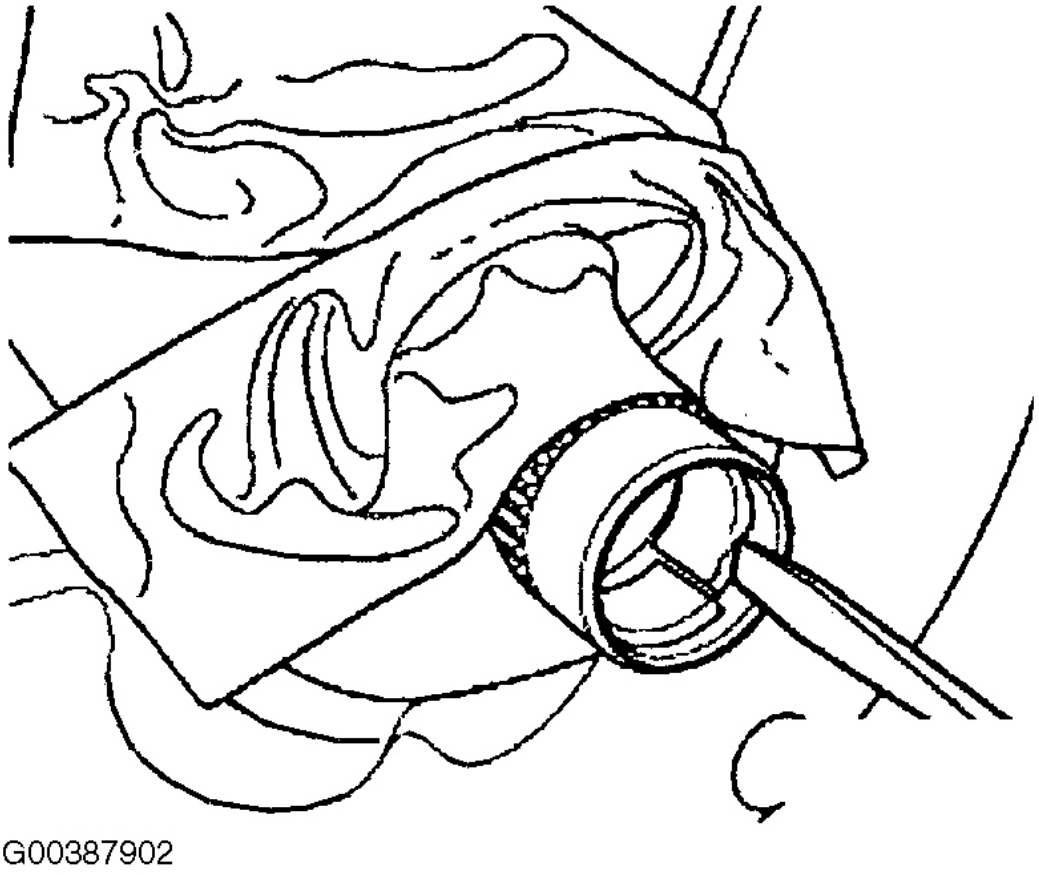


Fig. 37: Installing Drive On 5th Gear Wheel
Courtesy of VOLKSWAGEN OF AMERICA, INC.

Checking 5th gear synchro-ring

- Before installing 5th gear wheel and synchro-ring press synchro-ring onto cone of gear wheel and measure gap -a- with a feeler gauge.

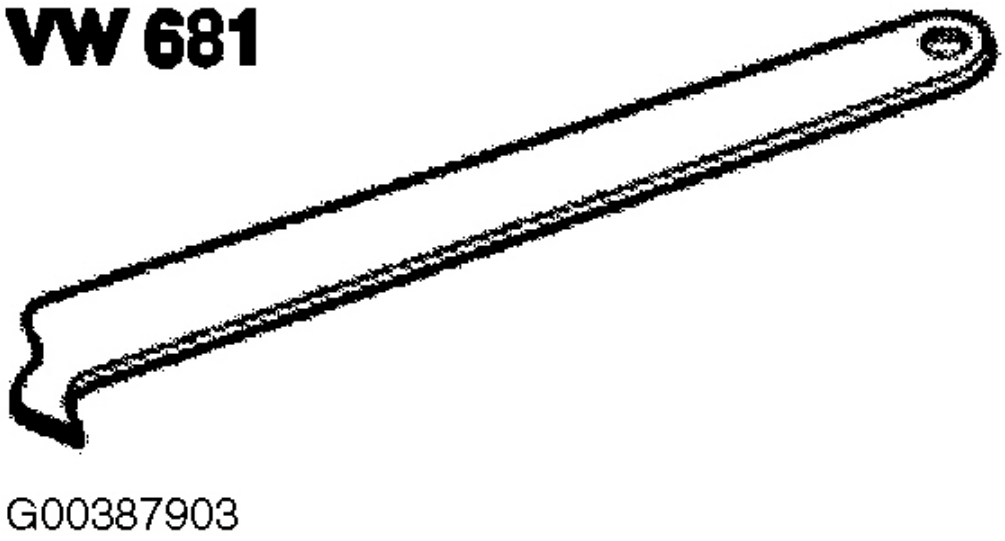


Fig. 38: Measuring Synchro-Ring And Gear Gap
Courtesy of VOLKSWAGEN OF AMERICA, INC.

5TH GEAR SYNCHRO-RING GAP AND WEAR LIMIT

Gap -a-	New	Wear limit
5th gear	1.1... 1.7 mm	0.5 mm

- Install 5th gear wheel with needle roller bearing
- Place 5th gear synchro-ring on gear wheel
- Assembly 5th gear synchro-hub/locking collar before installing. See **Assembling 5th gear locking collar/synchro-hub** .

Installation position 5th gear synchro-hub/locking collar

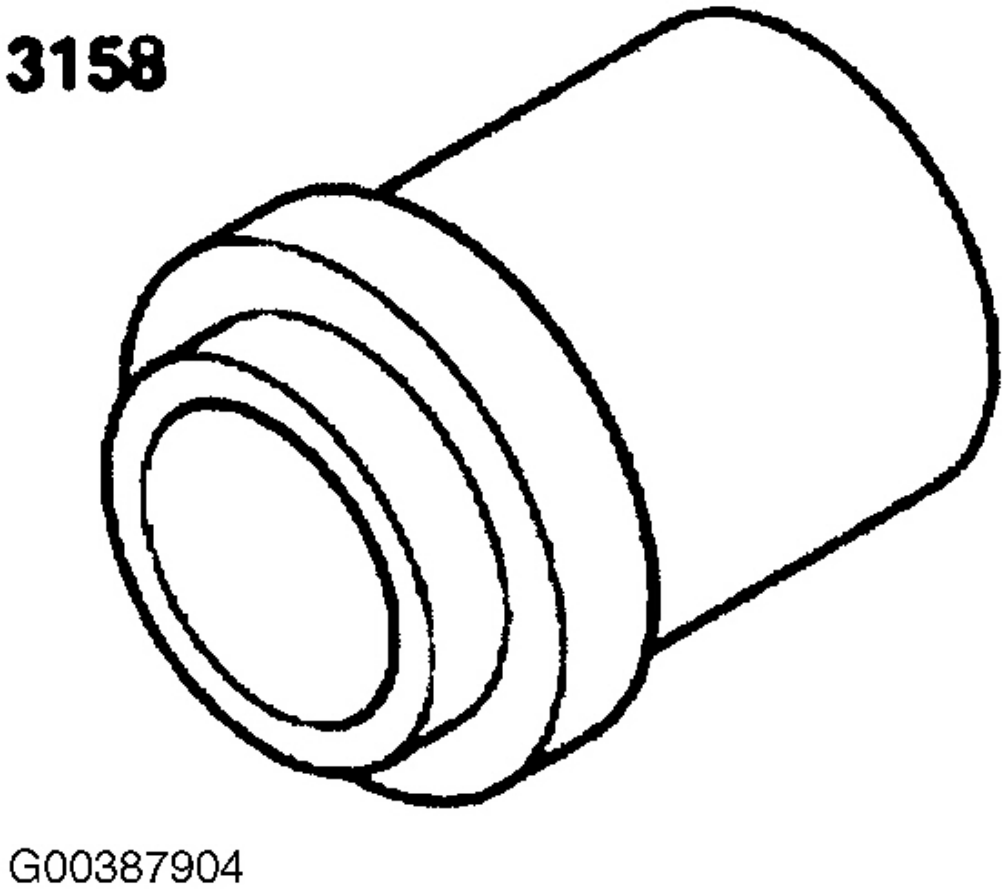


Fig. 39: Identifying Installation Position 5th Gear Synchro-Hub/Locking Collar
Courtesy of VOLKSWAGEN OF AMERICA, INC.

The pointed teeth of the locking collar (arrow -1-) and the high shoulder of the synchro-hub (arrow -2-) face the transmission housing.

The mountings (arrow -3-) of the syncro-hub are inline with the cast locking pieces of the syncro-ring (arrows in **5th gear synchro-ring with cast locking pieces (arrows)**).

5th gear synchro-ring with cast locking pieces (arrows)

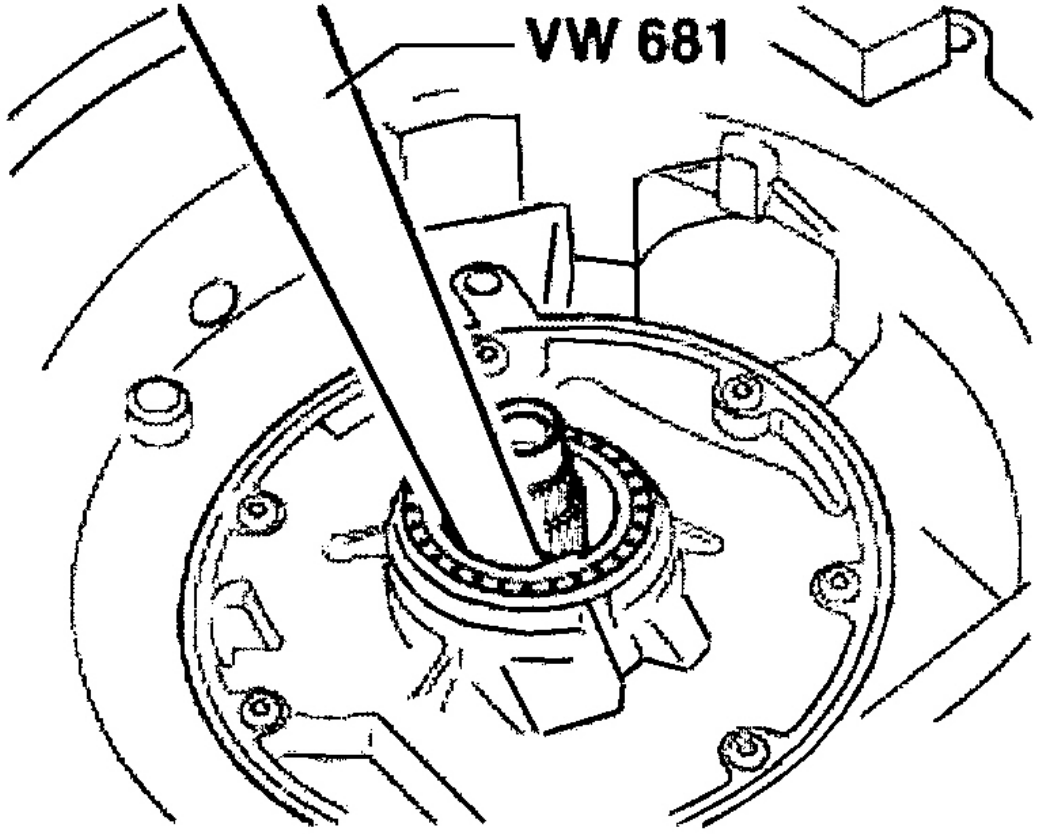


Fig. 40: Identifying 5th Gear Synchro-Ring With Cast Locking Pieces
Courtesy of VOLKSWAGEN OF AMERICA, INC.

- Drive on 5th gear synchro-hub

NOTE: When driving make sure synchro-ring is free to move.

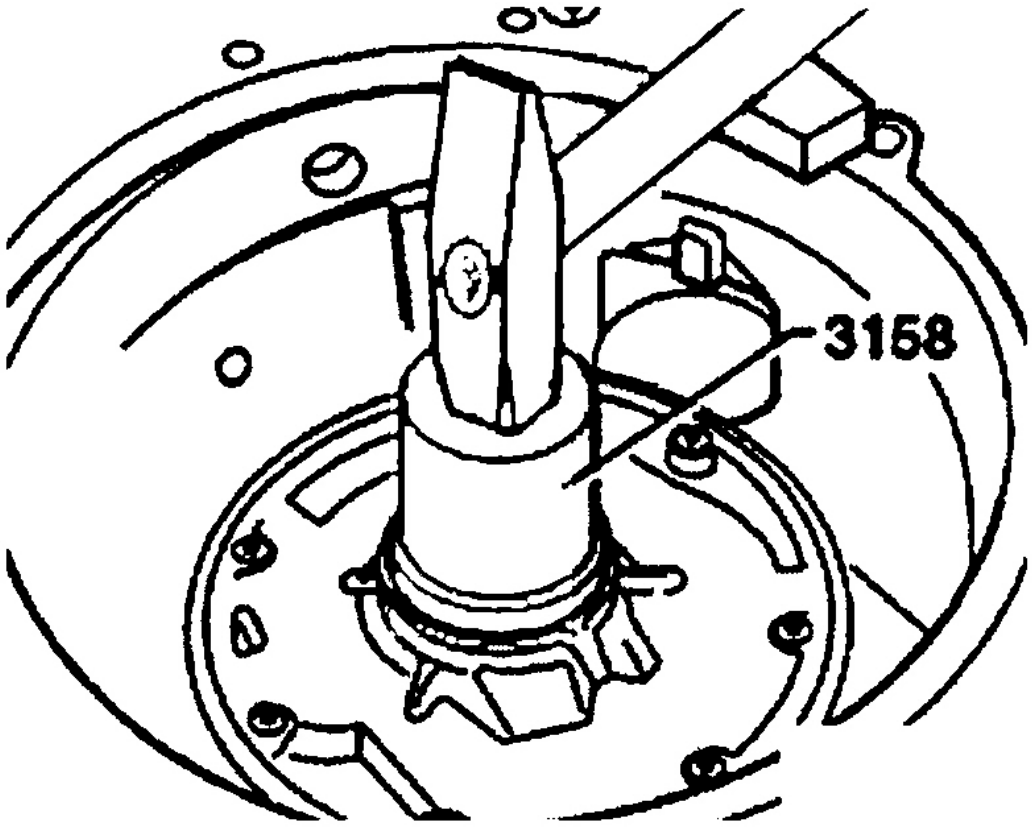


Fig. 41: Installing 5th Gear Synchro-Hub
Courtesy of VOLKSWAGEN OF AMERICA, INC.

- Screw-in securing bolts for synchro-hub and 5th gear wheel.

Installation position of dished spring for gear wheel and 5th gear synchro-hub securing bolts:

The outer diameter (concave side -arrows-) faces 5th gear.

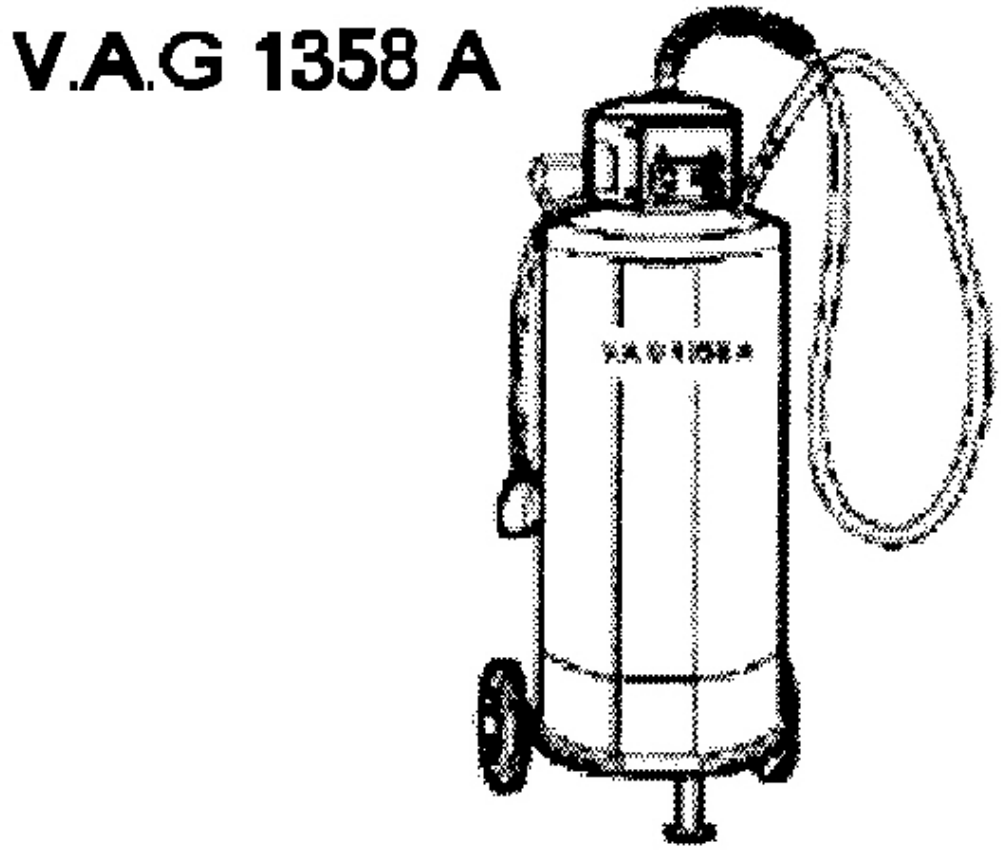


Fig. 42: Locating Outer Diameter Concave Side
Courtesy of VOLKSWAGEN OF AMERICA, INC.

- Engage two gears before tightening 5th gear synchro-hub and gear wheel securing bolts (arrows). See **Fig. 22** .
- Install 5th gear selector fork.

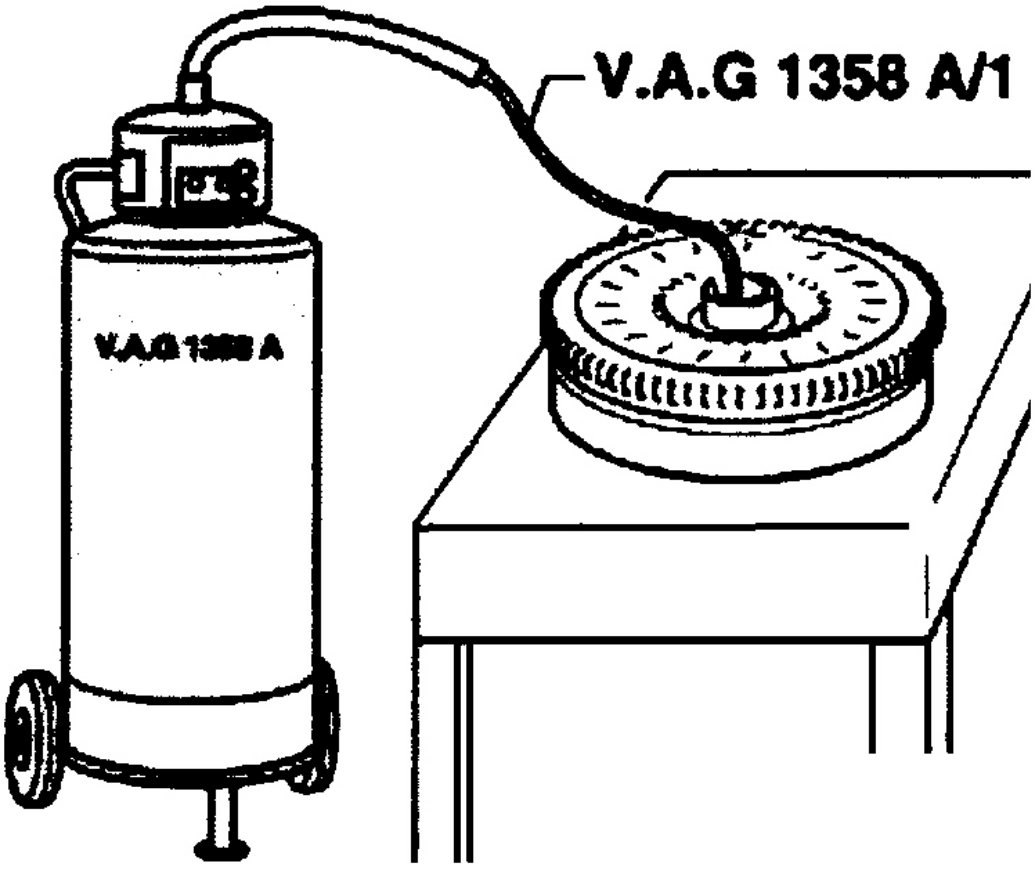
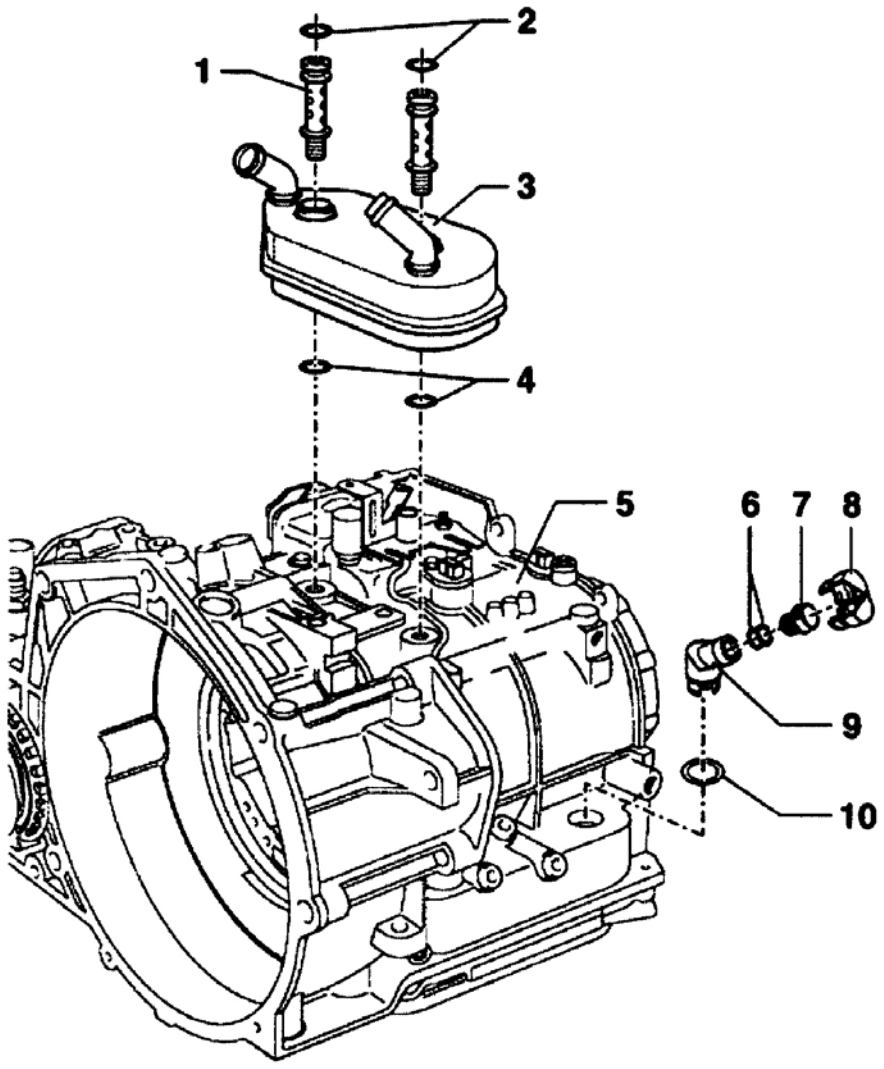


Fig. 43: Tightening 5th Gear Synchro-Hub And Gear Wheel Securing Bolts
Courtesy of VOLKSWAGEN OF AMERICA, INC.

Adjusting 5th gear:

- Engage 5th gear. Loosen bolt -1-. Press locking collar and selector fork jaws in direction of (arrow), then tighten bolt -1- to 25 N.m.



1 - Banjo bolt, 35 Nm
2 - O-ring
♦ Always replace
3 - ATF cooler
4 - O-ring
♦ Always replace
5 - Transmission housing
6 - Seal
♦ Always replace
7 - Plug
8 - Cap
9 - ATF filler tube
10 - O-ring
♦ Always replace

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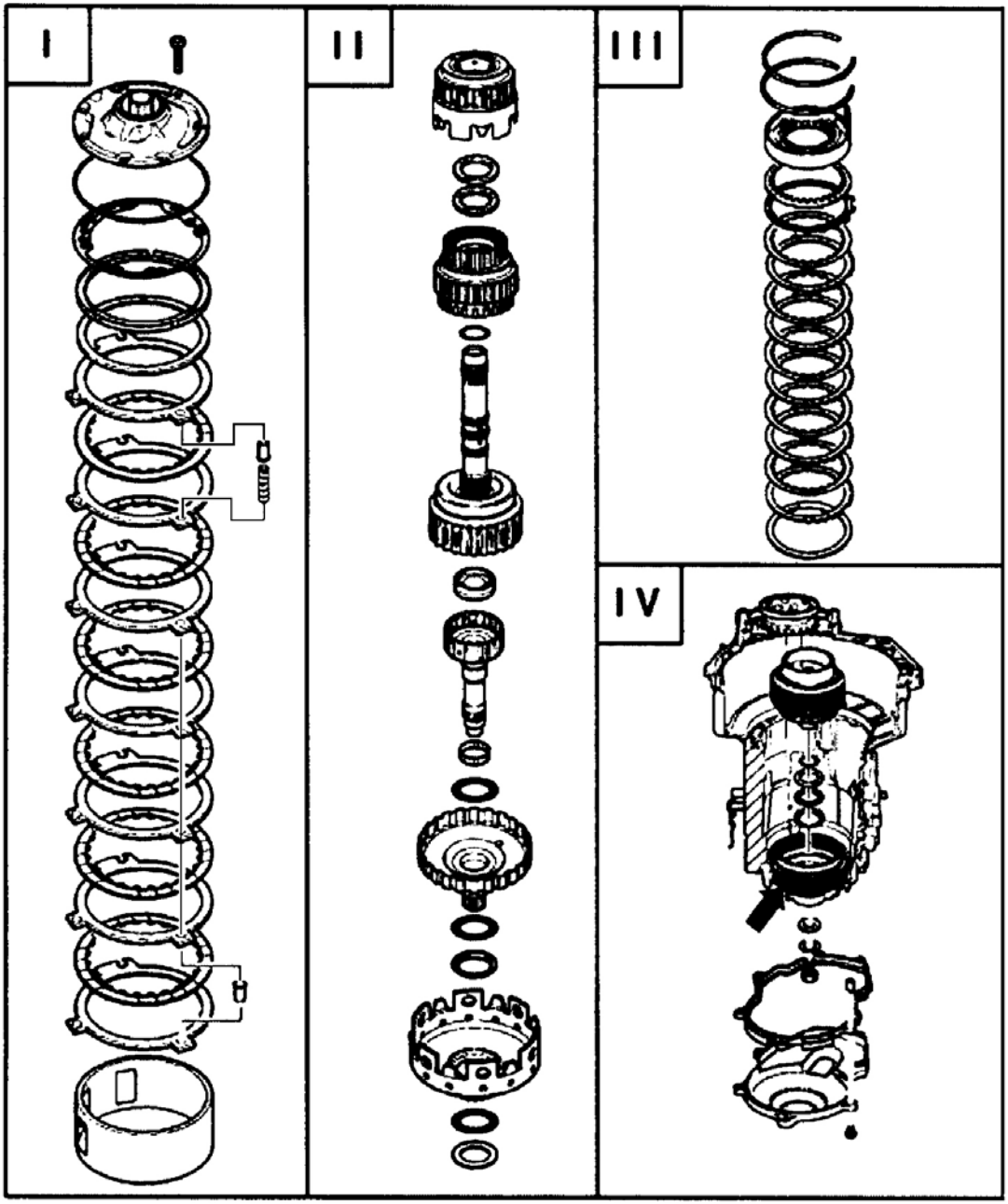
Fig. 44: Adjusting 5th Gear
Courtesy of VOLKSWAGEN OF AMERICA, INC.

- Check measurement: It must not be possible to slide a 0.2 mm feeler gauge between locking collar

and gearwheel. If necessary repeat adjustment.

- Disengage 5th gear. Locking collar must now be in neutral position. Synchro-ring must move freely.
- Select all gears.
- Install transmission housing cover
- Install flange shafts along with springs, thrust washers and tapered rings.



Note: It is not necessary to remove input gear (arrow).

I - ATF Pump To Support Tube
II - Reverse Clutch To Large Sun Gear
III - Freewheel & Reverse Gear Brake
IV - Planet Carrier

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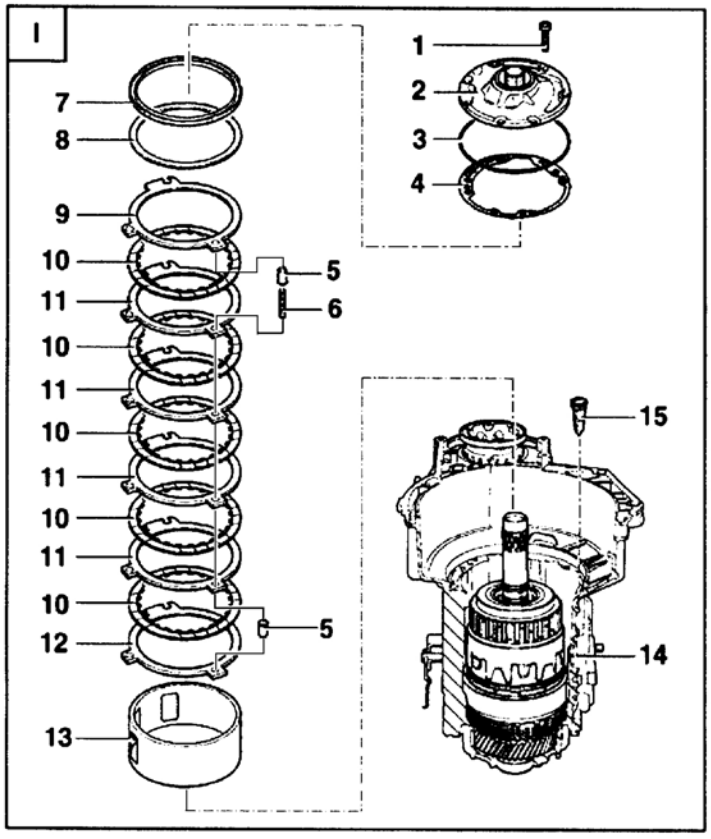
Fig. 45: Installing Flange Shafts
Courtesy of VOLKSWAGEN OF AMERICA, INC.

- Install release bearing guide sleeve. See **CLUTCH RELEASE BEARING** .
- Install clutch release lever and release bearing. See **CLUTCH RELEASE BEARING** .

TRANSMISSION HOUSING AND CLUTCH HOUSING, SERVICING

Special Tools And Equipment

- VW 295 Drift
- VW 295a Adapter
- VW 447 H Press plate
- VW512 Press disk
- 2040 Tube
- VW 454 Press piece



1 - Bolt
- Qty. 7
- Tighten to 8 Nm and turn 90° further
- The turning further of 90° may be done in several stages

2 - ATF pump with -B2- piston
- Replacement part is assigned according to transmission code letters

3 - O-ring
- Always replace
- Place on ATF pump

4 - Gasket
- Always replace

5 - Spring cap, Qty. 6
- Install 3 spring caps after installing first outer plate
- Install 3 spring caps before installing last outer plate

6 - Spring
- Qty. 3

7 - Retaining ring

8 - Shim

9 - Outer plate -B2-
- 3 mm thick

10 - Inner plate -B2-
- Before installing place new inner plates in ATF for 15 minutes

11 - Outer plate -B2-
- Always install 2 mm thick outer plates

12 - Outer plate -B2-
- Install 3 mm thick outer plate to supporting tube

13 - Supporting tube -B2-
- For -B2- plate package
- Replacement part is assigned according to transmission code letters
- Insert so that groove engages in wedge of freewheel

14 - Transmission housing with clutches installed

15 - Strainer
- Not installed until transmission manufacture date 14 02 0.

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Fig. 46: Identifying Special Tools And Equipment (1 Of 3)

Courtesy of VOLKSWAGEN OF AMERICA, INC.

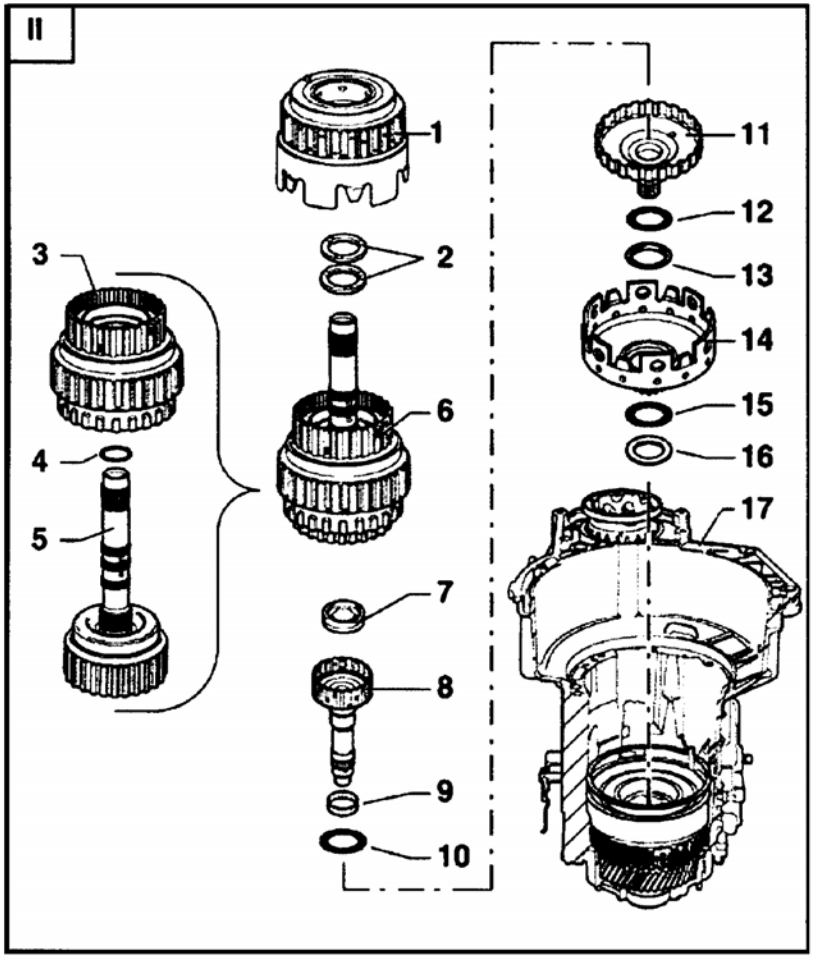
- VW 228 B Extractor
- VW 222 A Drift
- 3066 Spindle from assembly tool

Oil seal and sleeve are driven out in two pieces:

- 3124 Press piece

Oil seal and sleeve are driven out in one piece:

- VW 771 Multipurpose tool
- VW 771/37 Pulling hook



1 - Reverse gear clutch -K2-

2 - Shim

- Determining thickness-
  See CLUTCH PLAY BETWEEN -K1- AND -K2-, ADJUSTING
- 1 or 2 shims can be installed

3 - 1st to 3rd gear clutch -K1-

- Replacement part is assigned according to transmission code letters
- The clutches -K1- and -K3- are pressed together

4 - Seal

- Always replace

5 - 3rd and 4th gear clutch -K3- with turbine shaft

- Replacement part is assigned according to transmission code letters
- The clutches -K1- and -K3- are pressed together

6 - 1st to 3rd gear clutch -K1- with 3rd and 4th gear clutch -K3-

- The clutches -K1- and -K3- are pressed together

7 - Axial needle bearing with washer

- Axial needle bearing faces small input shaft

8 - Small input shaft

9 - Needle bearing

10 - Axial needle bearing

11 - Large input shaft

12 - Axial needle bearing

13 - Axial needle bearing washer

- With shoulder

14 - Large sun wheel

15 - Axial needle bearing

16 - Axial needle bearing washer

17 - Transmission housing with freewheel and circlips installed

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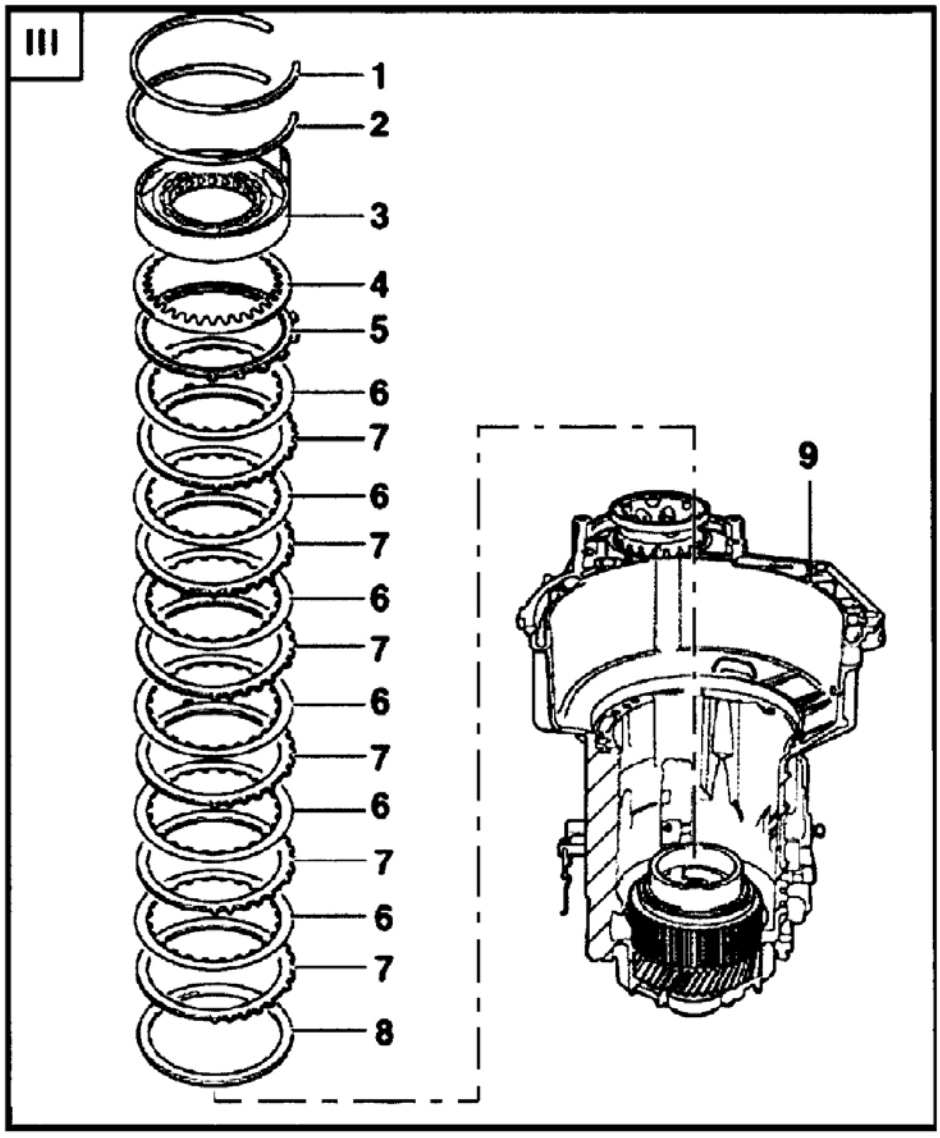
Fig. 47: Identifying Special Tools And Equipment (2 Of 3)
Courtesy of VOLKSWAGEN OF AMERICA, INC.

Special tools and equipment

- VW 353 Transmission support



1 - Circlip

- For supporting tube -B2-
- Installation position: Circlip open ends faces freewheel retaining wedge

2 - Circlip

- For freewheel
- Installation position: Circlip open ends faces freewheel retaining wedge

3 - Freewheel with -B1- piston

- Before removing freewheel, remove valve body and sealing plugs

4 - Dished spring

- Install with convex facing freewheel

5 - Pressure plate -B1-

- Install with flat side facing plates
- Replacement part is assigned according to transmission code letters

6 - Inner plate, -B1-

- Before installing place plates in ATF for 15 minutes

7 - Outer plate, -B1-

8 - Shim

9 - Transmission housing with planet carrier installed

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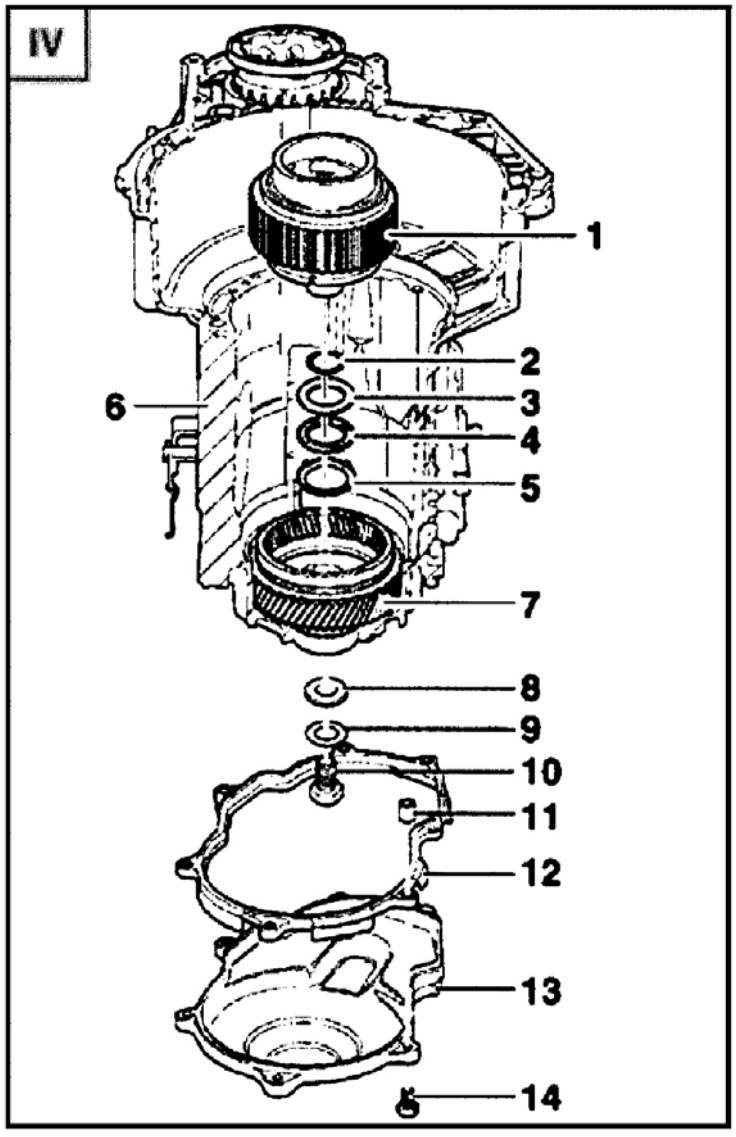
Fig. 48: Identifying Special Tools And Equipment (3 Of 3)
Courtesy of VOLKSWAGEN OF AMERICA, INC.

Oil seal and sleeve are driven out in one piece:

- T10148 Press piece



IV - Planet carrier and transmission housing with input gear and cover

1 - Planet carrier

2 - O-ring

- Always replace
- Insert in planet carrier

3 - Axial needle bearing washer

4 - Axial needle bearing

5 - Axial needle bearing washer

- Install smooth side in input gear

6 - Transmission housing with input gear installed

7 - Input gear

- Do not remove to disassemble planetary transmission

8 - Planet carrier shim

9 - Washer

10 - Bolt, 30 Nm

- For small input shaft

11 - Spacer bushing

- Clip qty. 7 into gasket

12 - Gasket

- Always replace

13 - Cover

14 - Bolt, 8 Nm

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Fig. 49: Identifying T10148 Press Piece
Courtesy of VOLKSWAGEN OF AMERICA, INC.

NOTE: The following list refers to items in Fig. 50 .

1. **Transmission housing**
   - If replaced: Adjust input shaft and differential. See **Adjustment overview**
2. Needle roller bearing
   - For output shaft
   - Removing. See **Driving out needle roller bearing**
   - Installing and securing. See **Driving needle roller bearing in onto stop**
3. **Oil filler plug, 30 N.m**
   - Without magnet
4. **Shim**
   - For input shaft
   - Adjustment overview. See **Adjustment overview**
5. **Outer race/tapered roller bearing**
   - For output shaft
   - Removing and installing. See **Output shaft, disassembling and assembling**
   - If replaced: Adjust output shaft. See **Output shaft, adjusting**
6. **Outer race/tapered roller bearing**
   - For input shaft
   - Removing and installing. See **Output shaft, disassembling and assembling**
   - If replaced: Adjust input shaft. See **Output shaft, adjusting**
7. **Shim**
   - For input shaft
   - Adjustment overview. See **Adjustment overview**
8. **Outer race/tapered roller bearing**
   - For input shaft
   - Removing and installing. See **Pressing out tapered roller bearing outer race**
   - If replaced: Adjust input shaft. See **Input shaft, adjusting**
9. **Needle bearing**
   - Removing and installing. See **Pulling needle roller bearing out of clutch housing**
10. **Dowel sleeve**
    - (Qty. 2)
11. **Starter bushing**
    - Not installed in all transmissions
    - Pulling out. See **Pulling out starter bushing** .

- Driving in. See **Driving bushing for starter in flush**
- Can be replaced without removing transmission

12. **Clutch housing**
    - If replaced: Adjustment overview. See **Adjustment overview**
13. **Guide sleeve**
    - With input shaft seal and a vulcanized O-ring
    - Driving-out oil seal. See **Driving oil seal out of guide sleeve**
    - Driving-in oil seal. See **Drive oil seal into guide sleeve onto stop**
    - Remove guide sleeve to change oil seal
    - If damaged replace guide sleeve and O-ring together
14. **Socket head bolt, 20 N.m**
    - Self-locking
    - Always replace
15. **Oil seal**
    - Replacing with installed transmission. See **FLANGE SHAFT OIL SEALS (TRANSMISSION INSTALLED), REPLACING**
16. **Sleeve**
    - For oil seal (Item 15)
    - Removing. See **Prying sleeve out with a screwdriver**
    - Installing. See **Pulling sleeve in**
17. **One piece oil seal and sleeve**
    - With damaged oil seal, replace both oil seal and sleeve
    - Removing. See **Pulling out sleeve and oil seal**
    - Installing. See **Driving in sleeve and oil seal**
18. **Speedometer drive**
    - For aluminum tighten to 30 N.m
    - For synthetic material tighten to 10 N.m
19. **Oil drain plug, 30 N.m**
    - Without magnet
20. **Outer race/tapered roller bearing**
    - For differential
    - Pressing in and out. See **Differential, disassembling and assembling**
    - If replaced: Adjust differential. See **Differential, adjusting**
21. **Magnet**
    - Held in place by housing joint surface
22. **Outer race/tapered roller bearing**
    - For differential

- Pressing in and out. See **Differential, disassembling and assembling**
- If replaced: Adjust differential. See **Differential, adjusting**

23. **Shim**
    - For differential
    - Adjustment overview. See **Adjustment overview**
24. **Oil seal**
    - Replacing. See **FLANGE SHAFT OIL SEALS (TRANSMISSION INSTALLED), REPLACING**

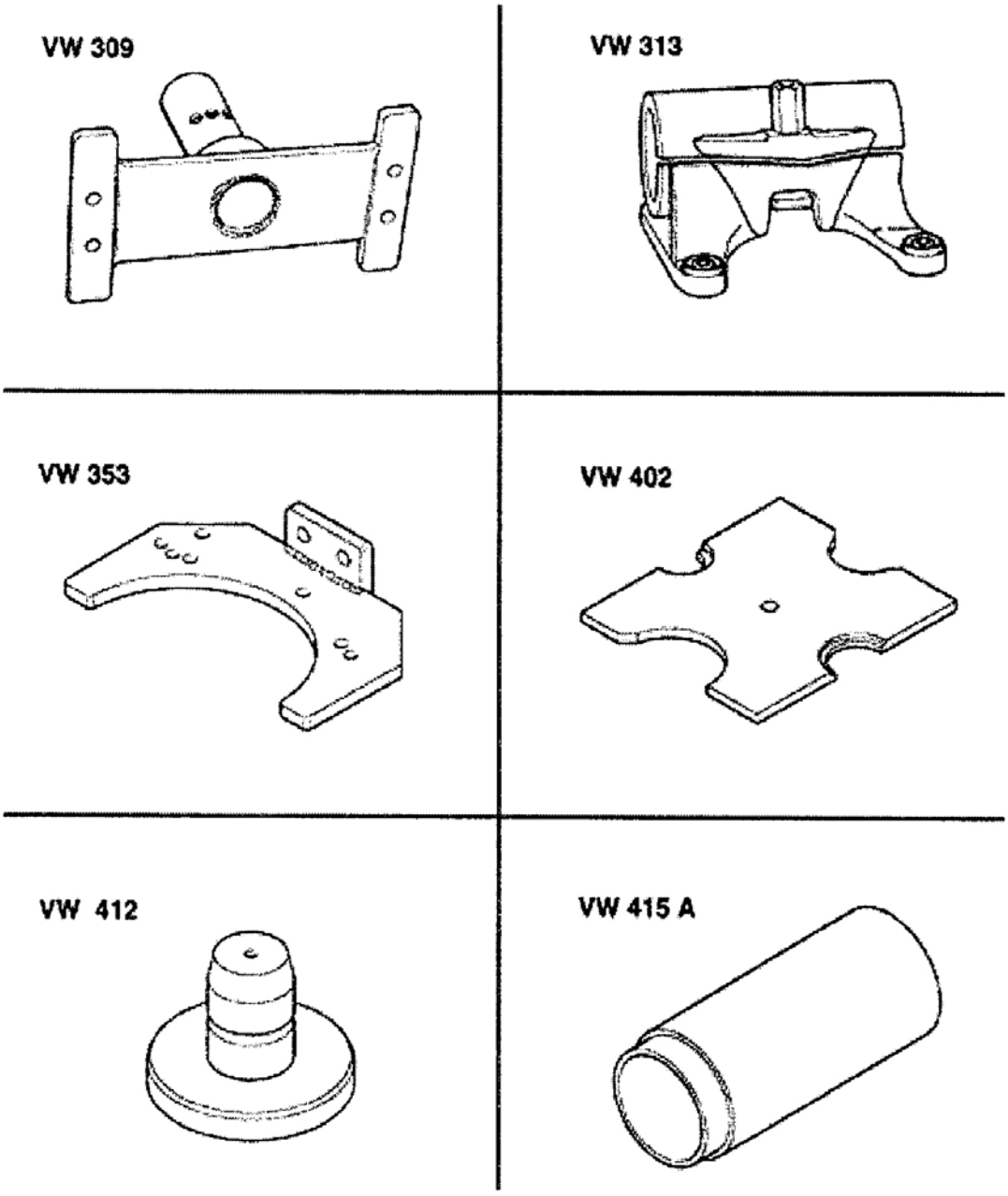

Fig. 50: Exploded View Of Transmission Housing
Courtesy of VOLKSWAGEN OF AMERICA, INC.

Driving out needle roller bearing

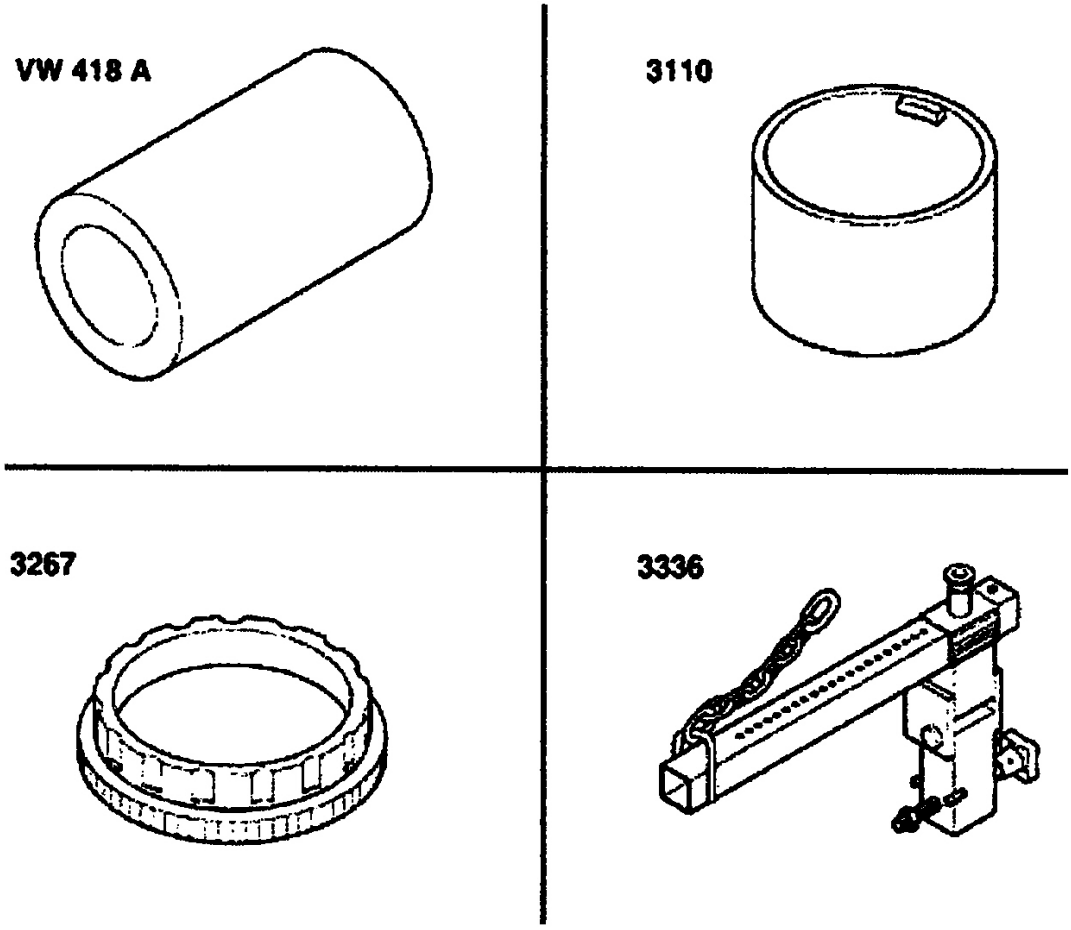

Fig. 51: Driving Out Needle Roller Bearing
Courtesy of VOLKSWAGEN OF AMERICA, INC.

Driving needle roller bearing in onto stop

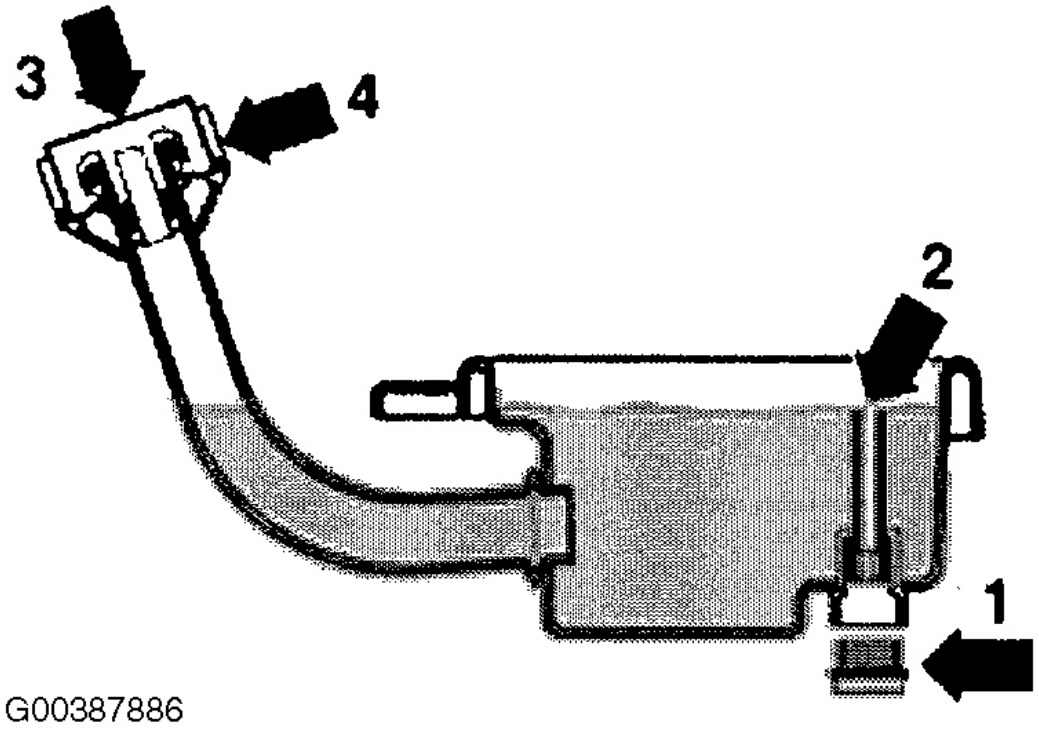

Fig. 52: Driving Needle Roller Bearing In Onto Stop
Courtesy of VOLKSWAGEN OF AMERICA, INC.

- Secure needle roller bearing in transmission housing at three points (120° offset) with a punch.

Driving oil seal out of guide sleeve

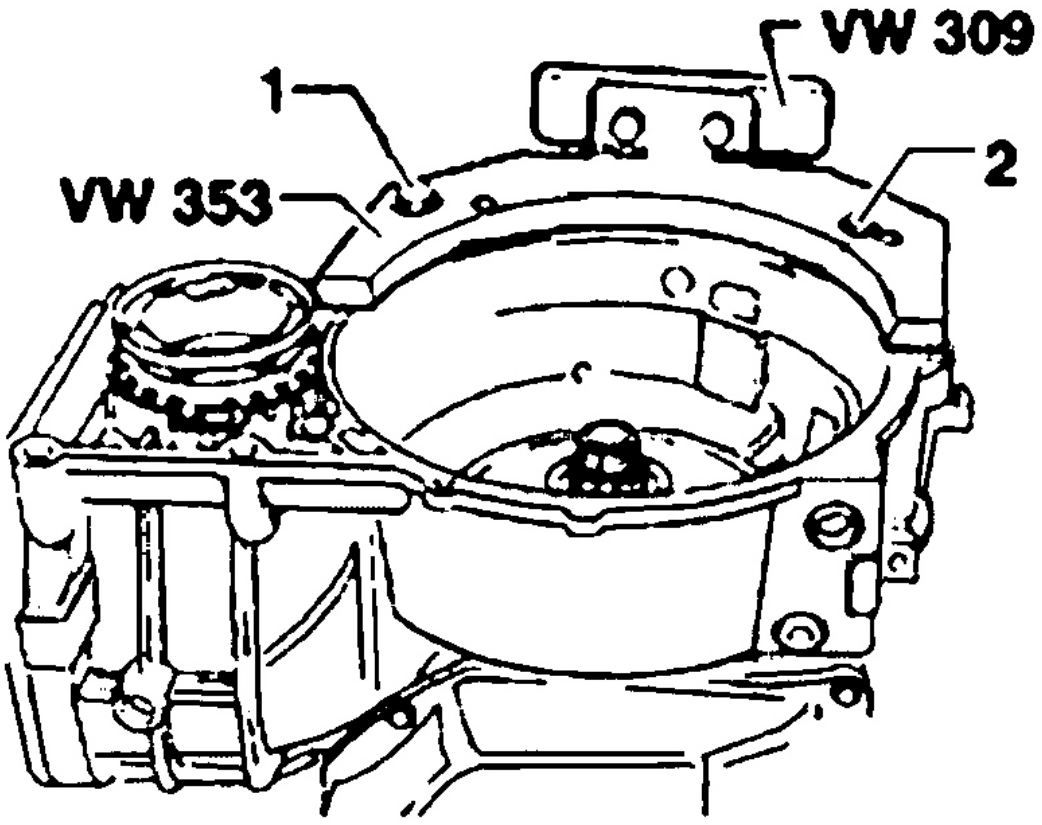

Fig. 53: Driving Oil Seal Out Of Guide Sleeve
Courtesy of VOLKSWAGEN OF AMERICA, INC.

Drive oil seal into guide sleeve onto stop

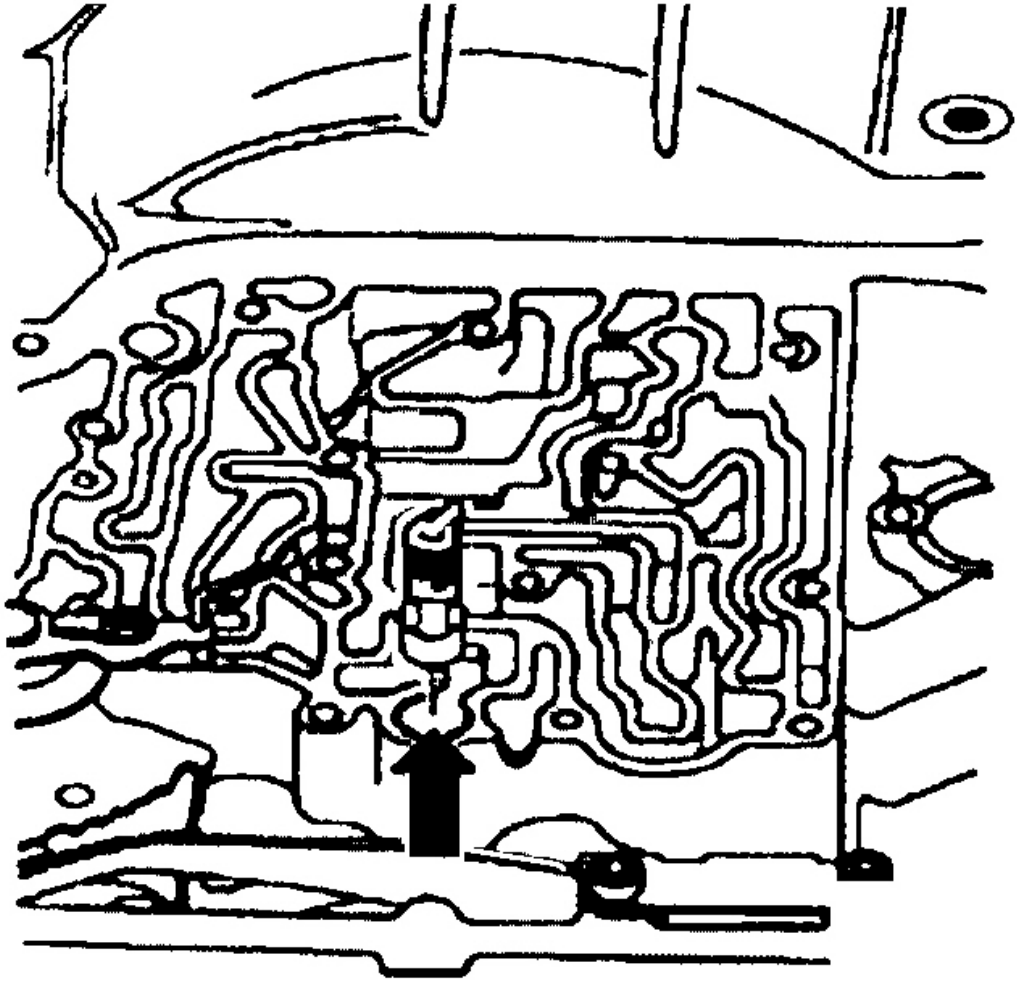

Fig. 54: Driving Oil Seal Into Guide Sleeve Onto Stop
Courtesy of VOLKSWAGEN OF AMERICA, INC.

Pulling out starter bushing

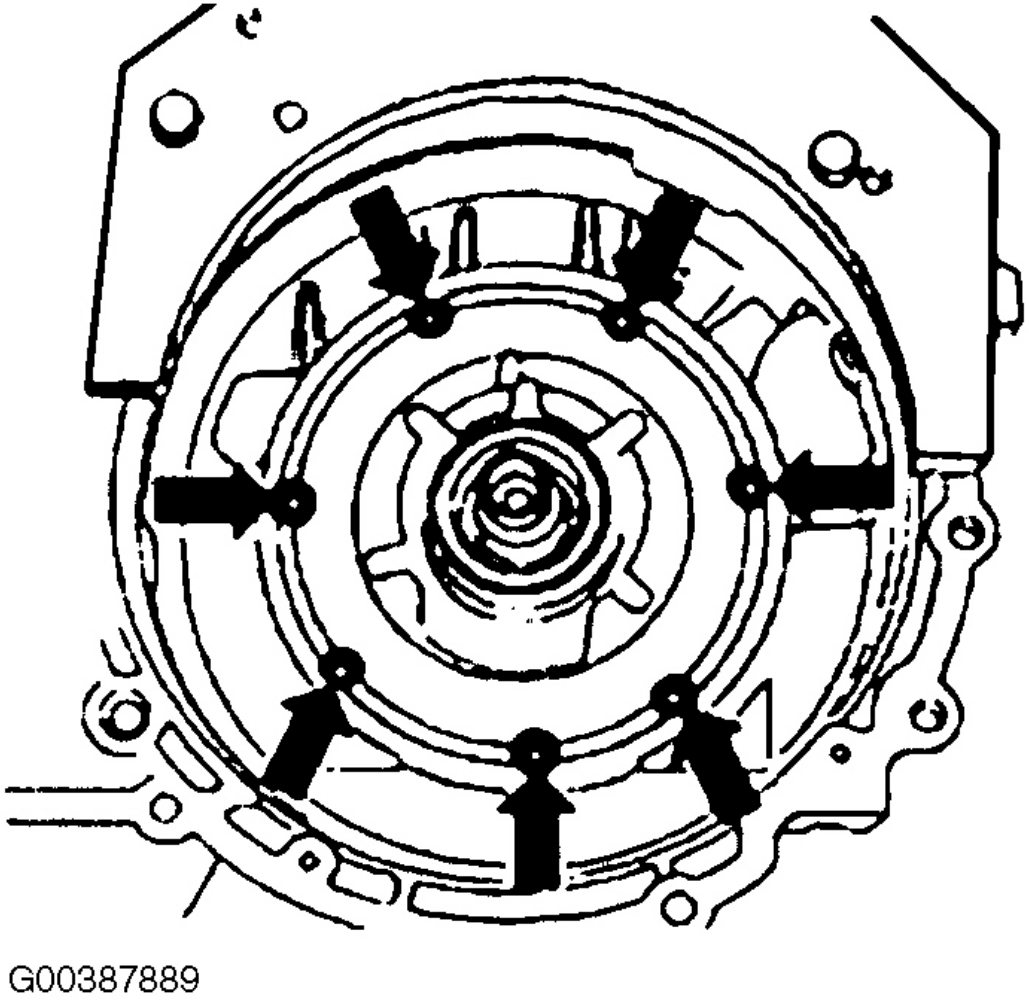

Fig. 55: Pulling Out Starter Bushing
Courtesy of VOLKSWAGEN OF AMERICA, INC.

Mounting sequence from extractor VW 228 b

- Turn the nut on the thread of the extractor in direction of tensioning bolt as far as possible.
- Install extractor VW 228 b onto stop.
- Now tighten tensioning bolt until the extractor VW 228 b is tensioned with the bushing.

Driving bushing for starter in flush

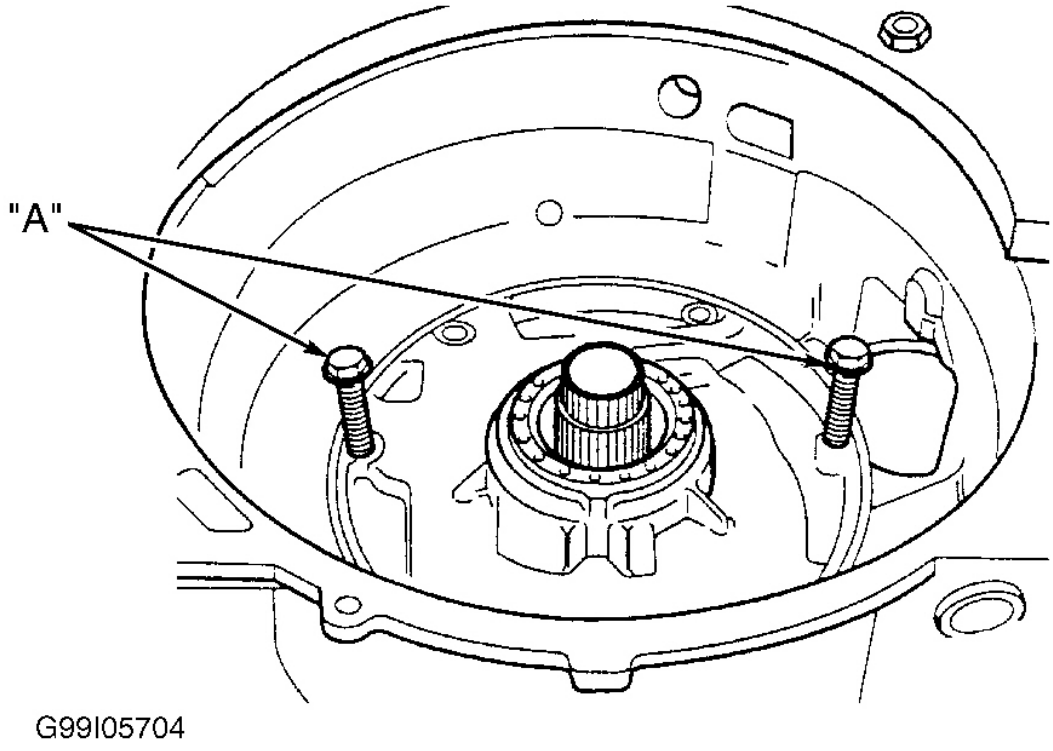

Fig. 56: Driving Bushing For Starter In Flush
Courtesy of VOLKSWAGEN OF AMERICA, INC.

Prying sleeve out with a screwdriver

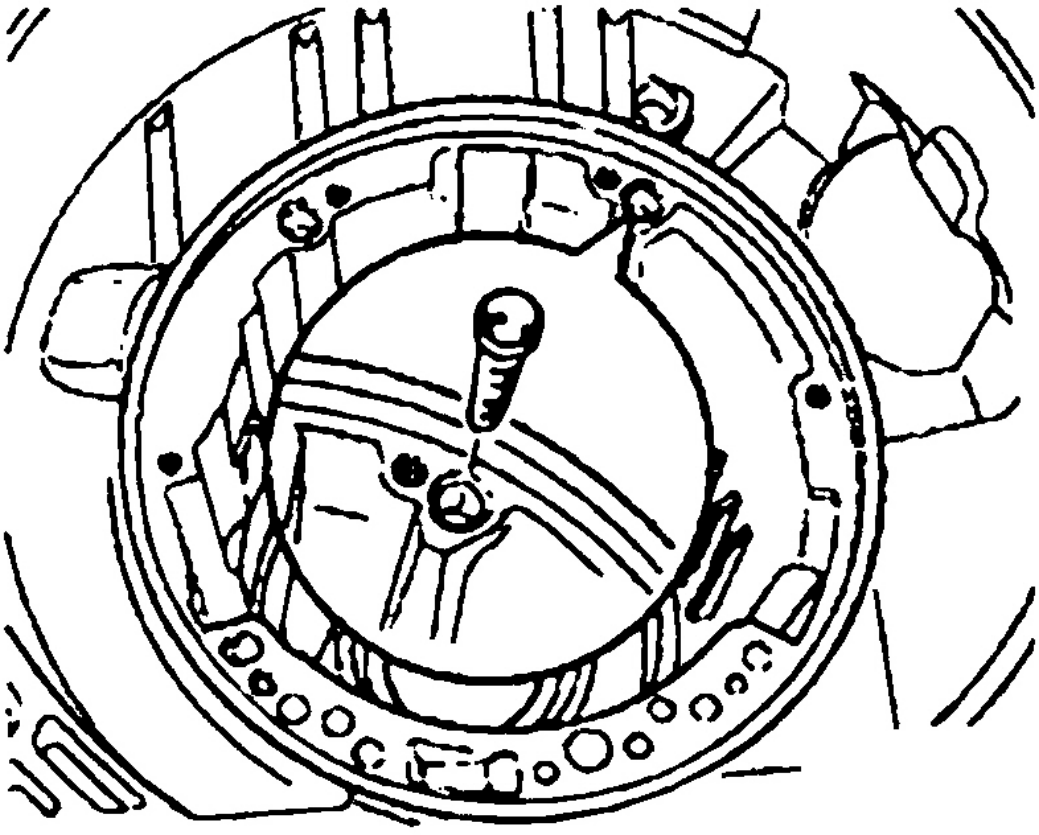

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Fig. 57: Prying Sleeve Out With Screwdriver
Courtesy of VOLKSWAGEN OF AMERICA, INC.

Pulling sleeve in

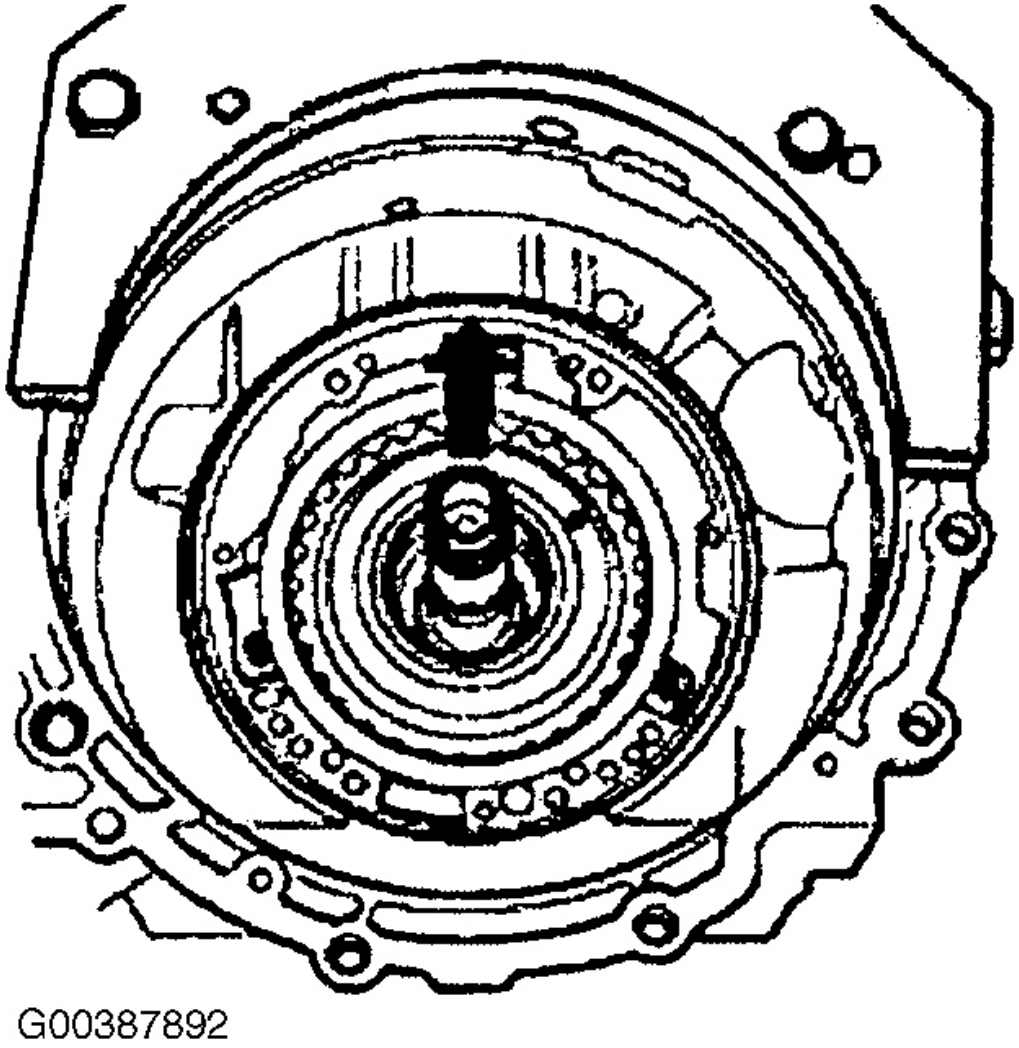

Fig. 58: Installing Sleeve
Courtesy of VOLKSWAGEN OF AMERICA, INC.

A. Screw threaded rod from assembly tool 3066 into differential threaded piece
B. Nut M12 with washer

- Pull sleeve in onto stop with thrust piece 3124 by turning on nut -B-.

NOTE: When transmission is disassembled press sleeve in with thrust piece 3124 onto stop.

Pulling out sleeve and oil seal

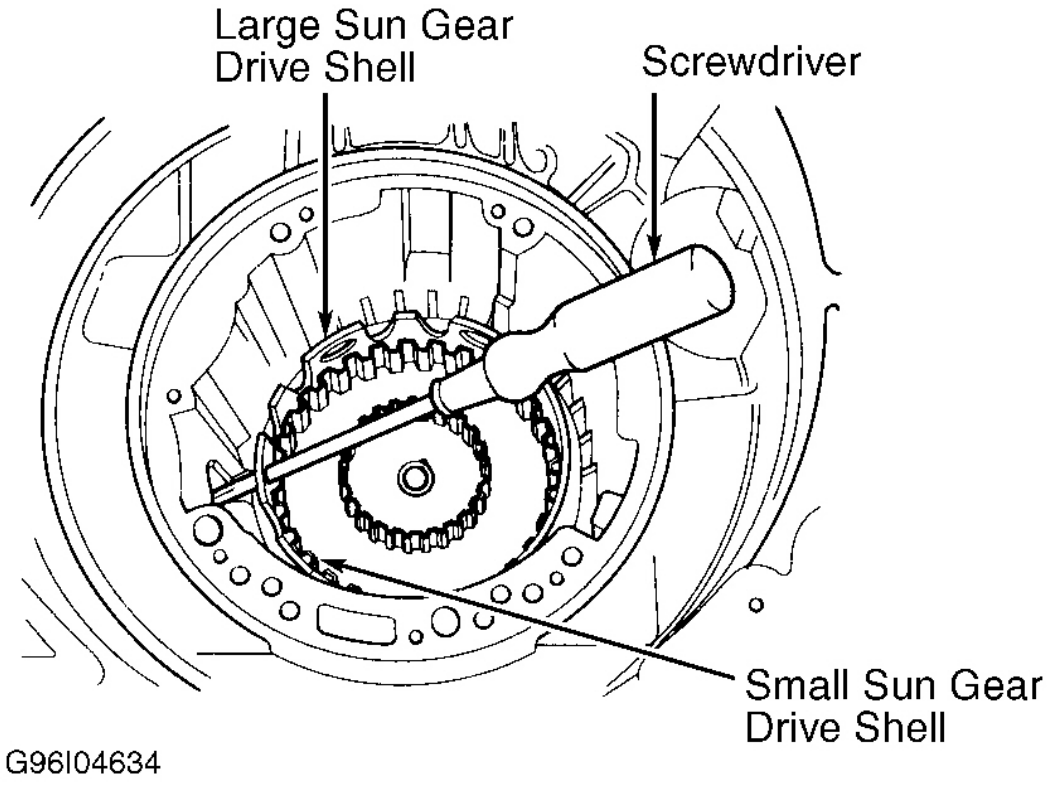

Fig. 59: Pulling Out Sleeve And Oil Seal
Courtesy of VOLKSWAGEN OF AMERICA, INC.

There is a step in inner diameter from sleeve

- For pulling out sleeve and oil seal, apply the pulling hook VW 771/37 at the back of the step in the sleeve.
- While pulling out press forcibly the pulling hook VW 771/37 into the sleeve.

Driving in sleeve and oil seal

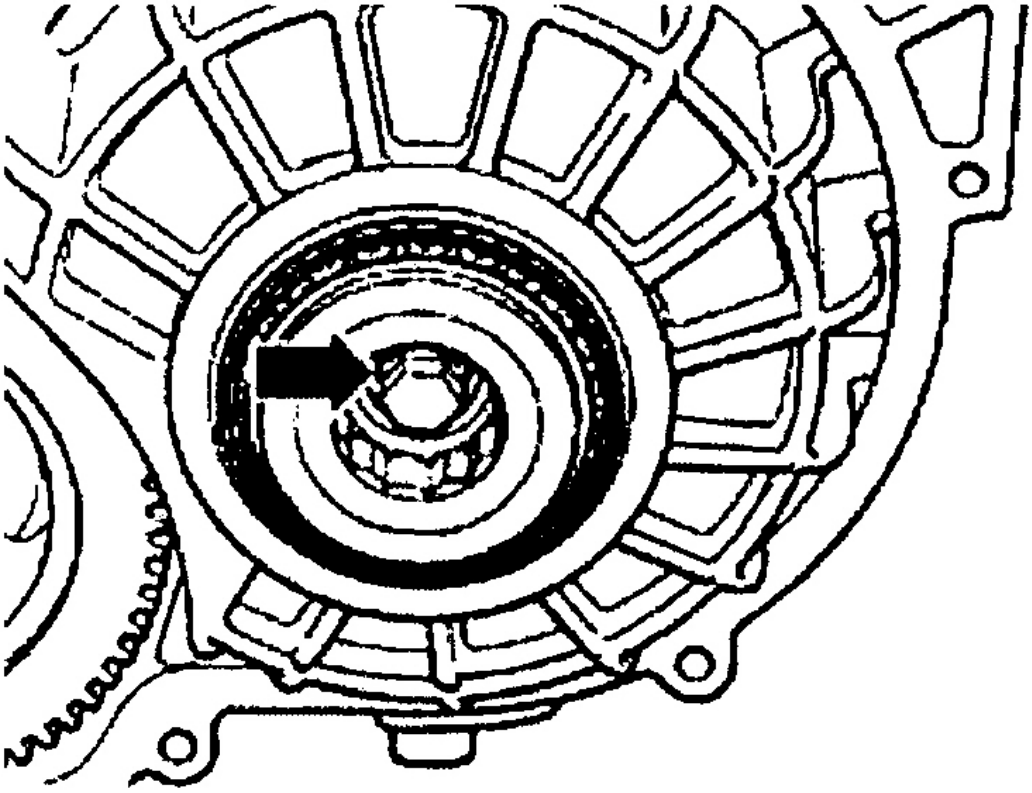

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Fig. 60: Driving In Sleeve And Oil Seal
Courtesy of VOLKSWAGEN OF AMERICA, INC.

Clean the sitting place of oil seal in transmission.

A. Screw threaded rod from assembly tool 3066 into differential threaded piece
B. Nut M12

- Drive sleeve over press piece T10148 onto stop by turning on nut -B-.

NOTE: When transmission is disassembled press sleeve in with press piece T10148 onto stop.

SELECTOR MECHANISM ON TRANSMISSION SIDE, UP TO 05.99, DISASSEMBLING AND ASSEMBLING

Special tools and equipment

- VW 439 Guide pin
- VW 402 Press plate
- VW 408 A Press tool
- VW 447 H Press plate
- 3129 Fitting tool

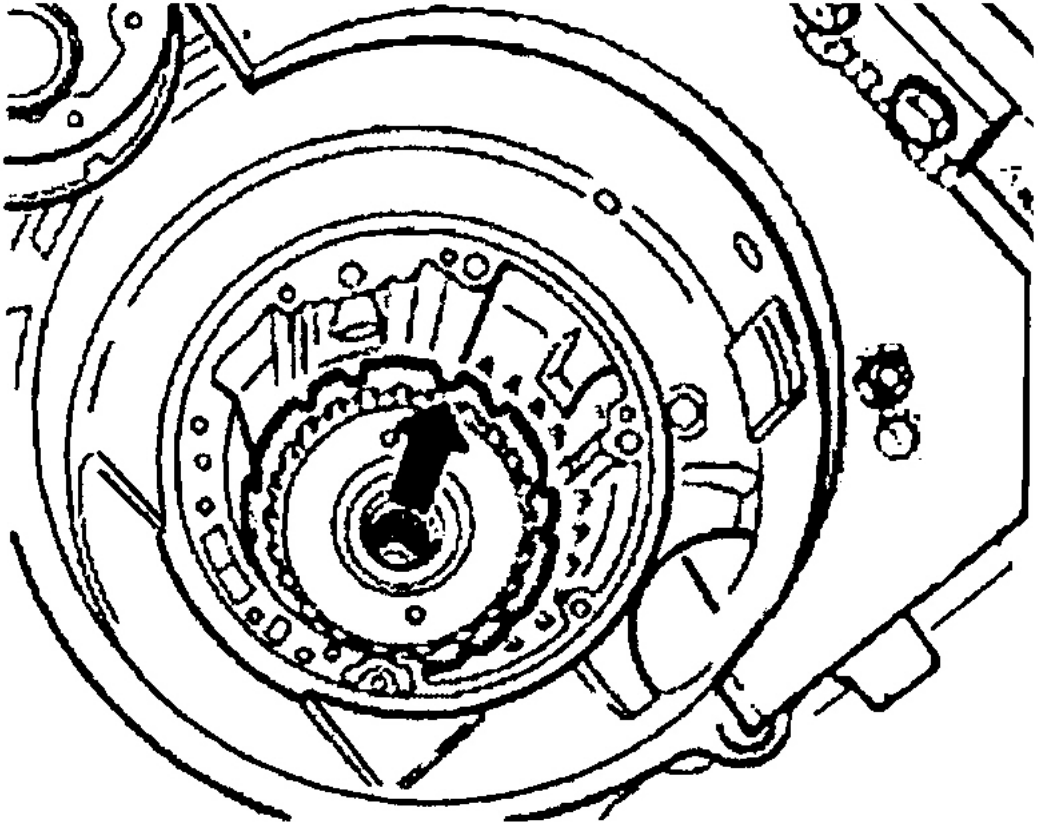

Fig. 61: Identifying Special Tools And Equipment
Courtesy of VOLKSWAGEN OF AMERICA, INC.

NOTE: The following list refers to items in Fig. 62 .

1. **Selector shaft**
2. **Stop ring**

3. **Ball sleeve**
    - Removing. See **Removing ball sleeve from selector mechanism cover**
    - Pressing in. See **Driving ball sleeve into selector mechanism cover**
4. **Oil seal**
    - Pry out with screwdriver
    - Installing. See **Installing oil seal onto stop**
5. **Selector mechanism cover**
6. **Sleeve**
    - The lug points to reverse light switch
    - Lightly coat lug with MoS_2 grease
7. **Hex nut, 25 N.m**
    - Self-locking
    - Always replace
8. **Housing**
    - For back-up light switch
9. **Bolt**
10. **Cap**
    - For transmission breather
11. **Sleeve**
    - Drive in onto stop if present as an individual part
12. **Gear selector lever**
    - Install so that master spline aligns with selector shaft
    - Can be replaced with selector mechanism installed
    - Installation position. See **GEAR LEVER**
13. **Relay lever**
    - Installation position. See **GEAR LEVER**
14. **Nut, 15 N.m**
15. **Actuating arm**
    - With axis pin for mounting relay lever
    - Installation position. See **SELECTOR MECHANISM**
16. **Bolt**
    - Press into actuating arm
17. **O-ring**
    - Pull onto actuating arm axis pin
18. **Spacer**
    - Press into relay lever
19. **Locking bolt, 40 N.m**

20. **End cover**

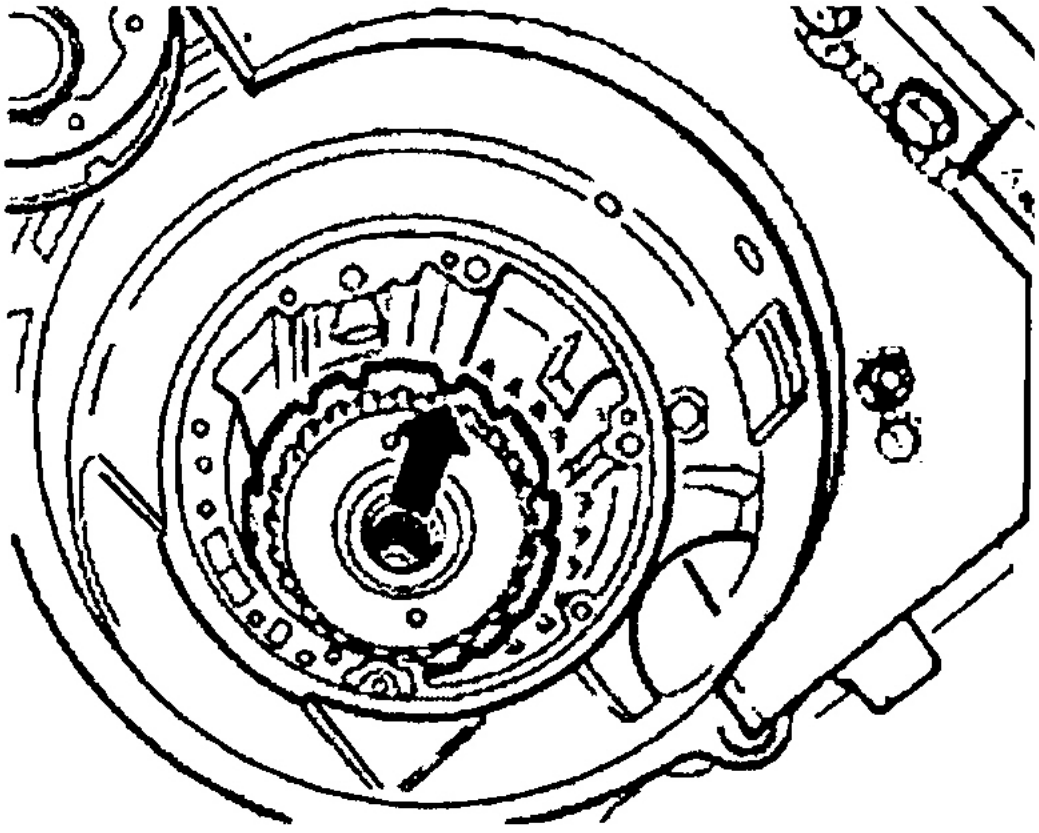

Fig. 62: Exploded View Of Selector Shaft Assembly (Up To 05.99)
Courtesy of VOLKSWAGEN OF AMERICA, INC.

Removing ball sleeve from selector mechanism cover

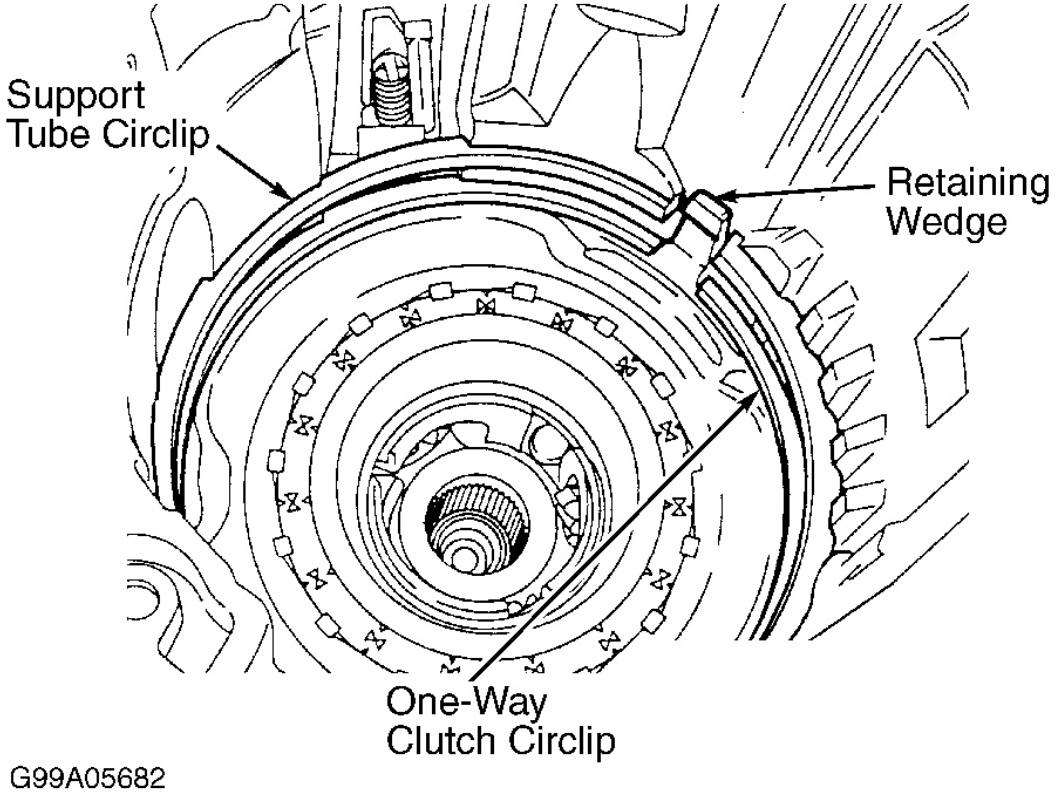

Fig. 63: Removing Ball Sleeve From Selector Mechanism Cover
Courtesy of VOLKSWAGEN OF AMERICA, INC.

- Before pulling out ball sleeve, destroy plastic cage and remove balls.

A. Internal extractor, e.g. Kukko 21/3, 18.5... 23.5 mm

Driving ball sleeve into selector mechanism cover

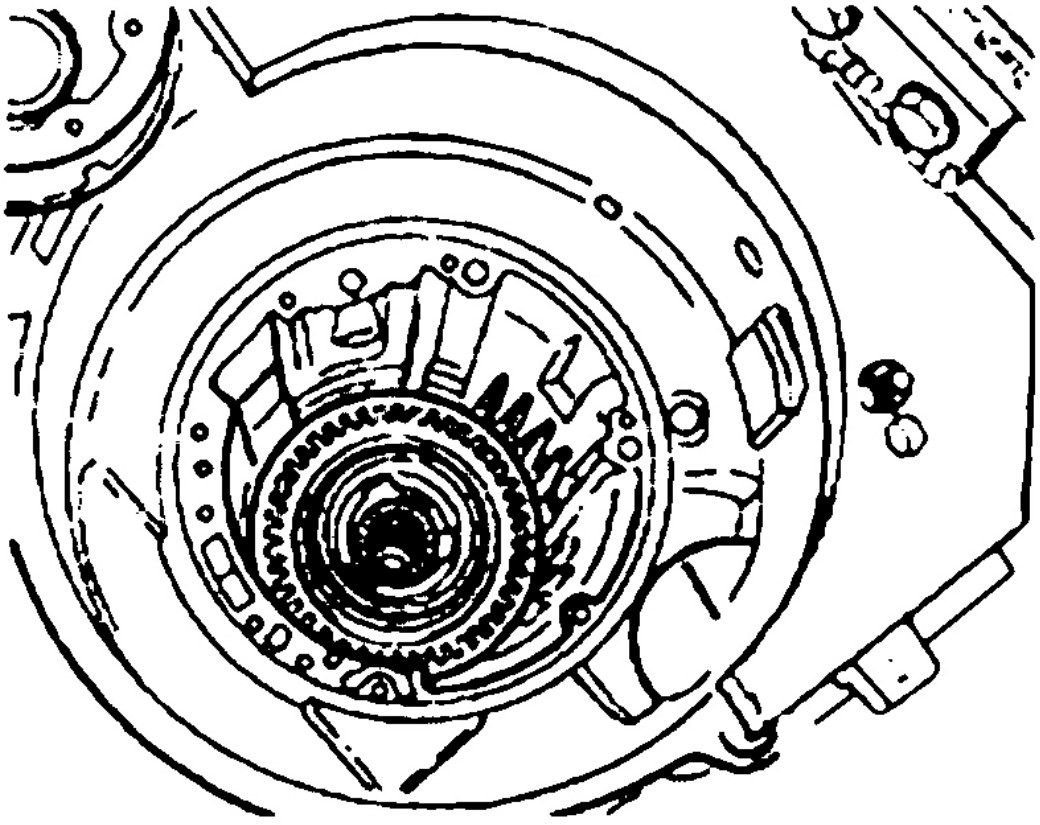

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Fig. 64: Driving Ball Sleeve Into Selector Mechanism Cover
Courtesy of VOLKSWAGEN OF AMERICA, INC.

Installing oil seal onto stop

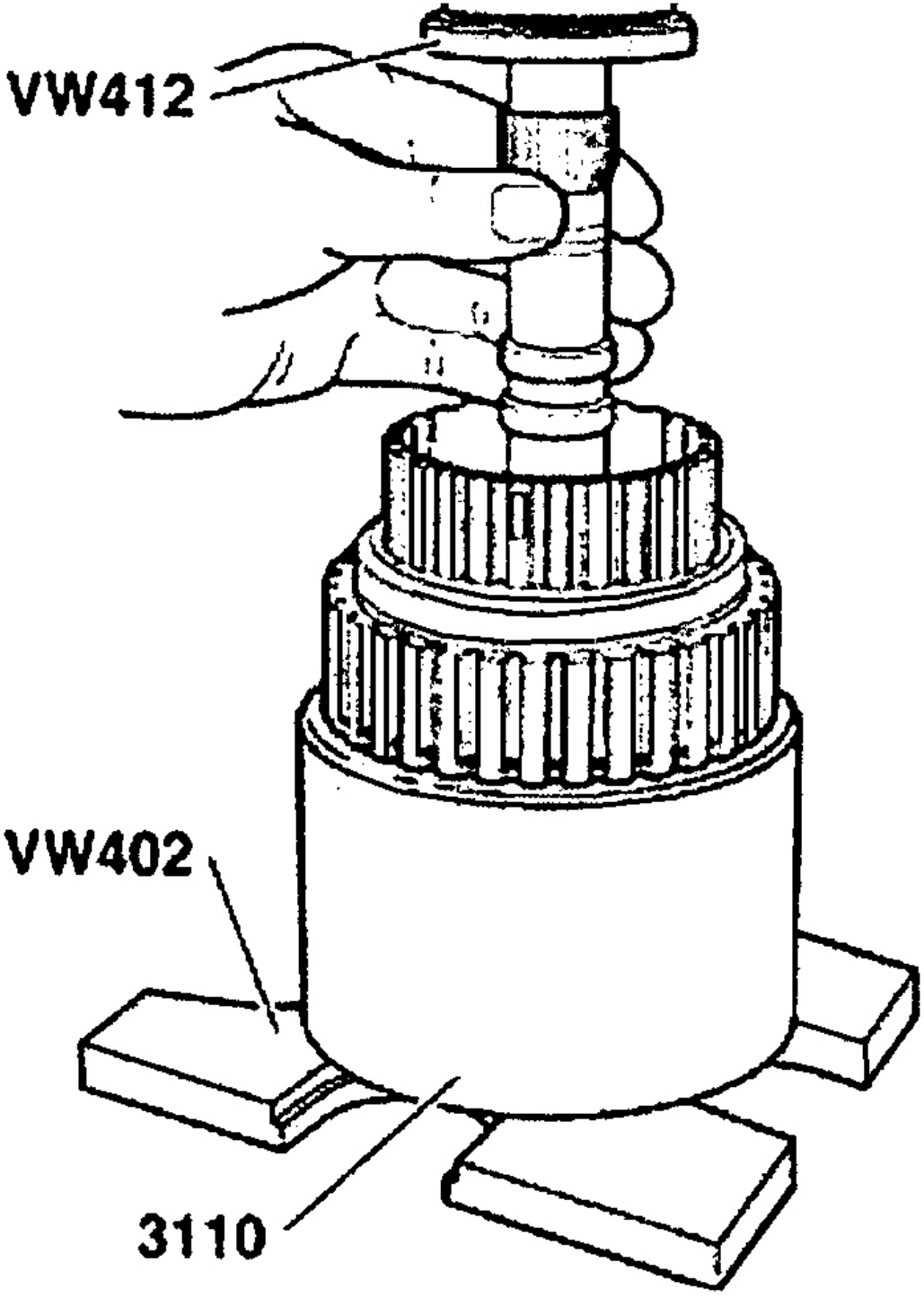

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Fig. 65: Installing Oil Seal Onto Stop
Courtesy of VOLKSWAGEN OF AMERICA, INC.

SELECTOR MECHANISM ON TRANSMISSION SIDE, AS OF 06.99, DISASSEMBLING AND ASSEMBLING

Special tools and equipment

- VW 401 Press plate
- VW 408 A Press tool
- VW 423 Tube
- VW 439 Guide pin
- VW 447 i Thrust plate
- 1 -Kukko21/3 Internal puller

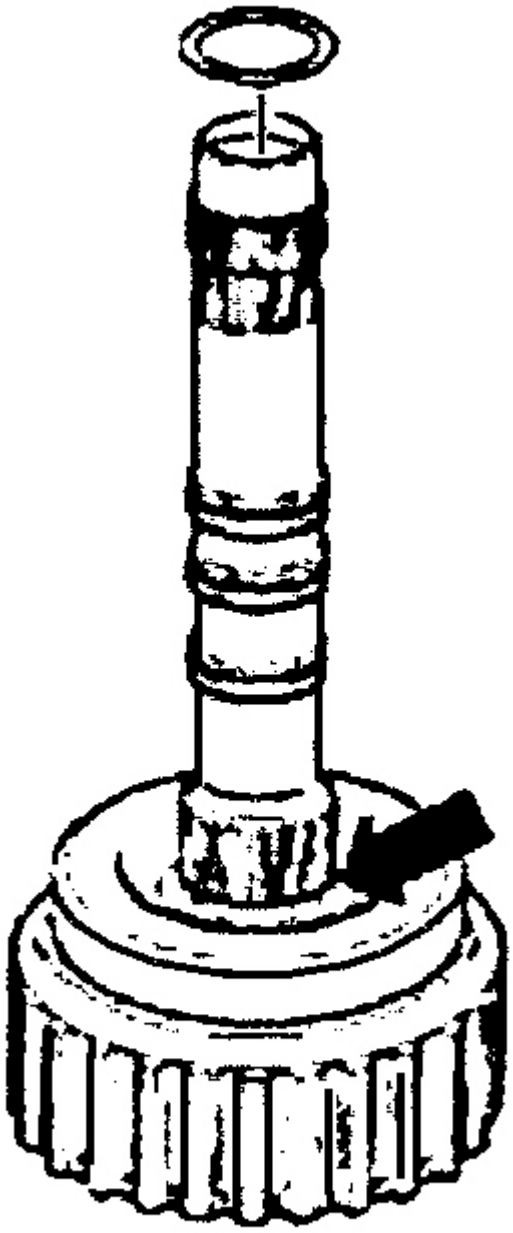

Fig. 66: Identifying Special Tools And Equipment
Courtesy of VOLKSWAGEN OF AMERICA, INC.

NOTE: The following list refers to items in Fig. 67 .

1. **Selector shaft**
   - As of date of manufacture September 4th 2000 the locating sleeve has been changed in order to guide the switching gear into the 4th gear gap when shifting down from 5th to 4th gear. See **Selector mechanism cover and selector shaft changed**
2. **Stop ring**
3. **Ball sleeve**
   - Removing. See **Removing ball sleeve from selector mechanism cover**
   - Pressing in. See **Pressing ball sleeve into selector mechanism cover**
4. **Selector mechanism cover**
   - As of date of manufacture of September 4th 2000, with additional bolt in order to guide the switching gear into the 4th gear gap when shifting down from 5th to 4th gear. See **Selector mechanism cover and selector shaft changed**
5. **Reversing light switch, 20 N.m**
   - Lightly coat lug with MoS_2 grease
6. **Cap**
   - For transmission breather
7. **Relay lever**
   - Installation position. See **GEAR LEVER**
8. **Bushing**
9. **Oil seal**
   - Pry out with screwdriver
   - Installing. See **Installing oil seal onto stop**
10. **Circlip**
11. **Hex nut, 25 N.m**
    - Self-locking
    - Always replace
12. **Gear selector lever**
    - Install so that master spline aligns with selector shaft
    - Can be replaced with selector mechanism installed
    - Installation position. See **GEAR LEVER**
13. **End cover**

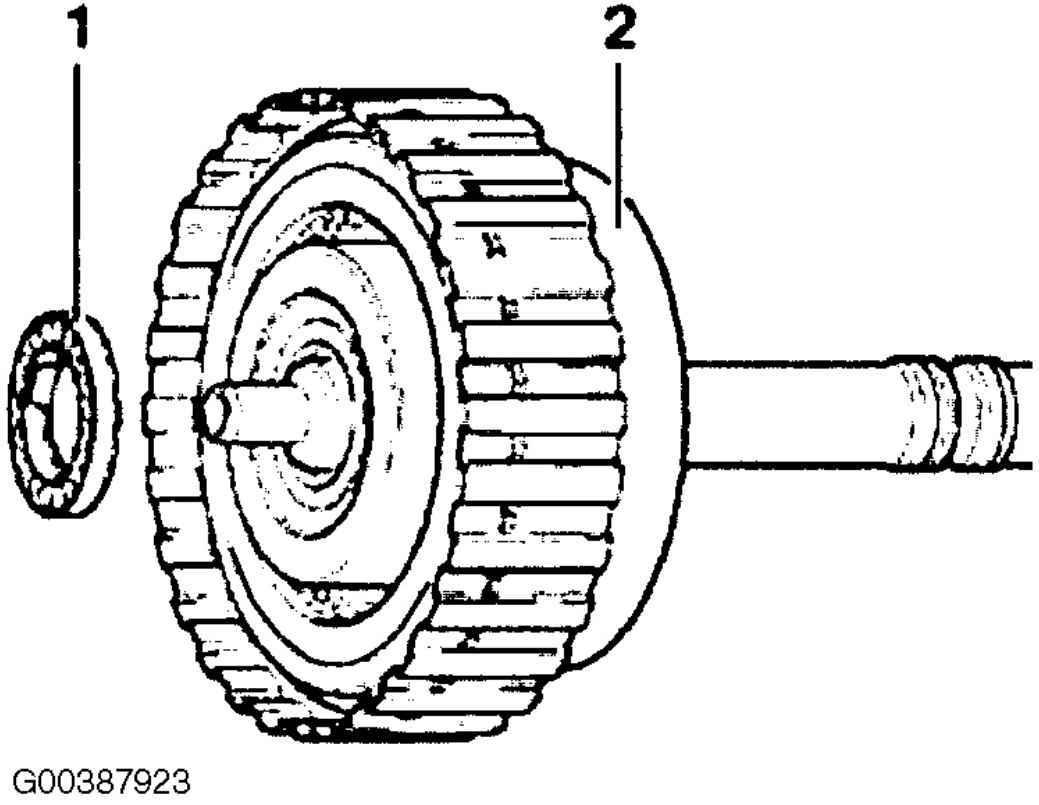

Fig. 67: Exploded View Of Selector Shaft Assembly (As Of 06.99)
Courtesy of VOLKSWAGEN OF AMERICA, INC.

Removing ball sleeve from selector mechanism cover

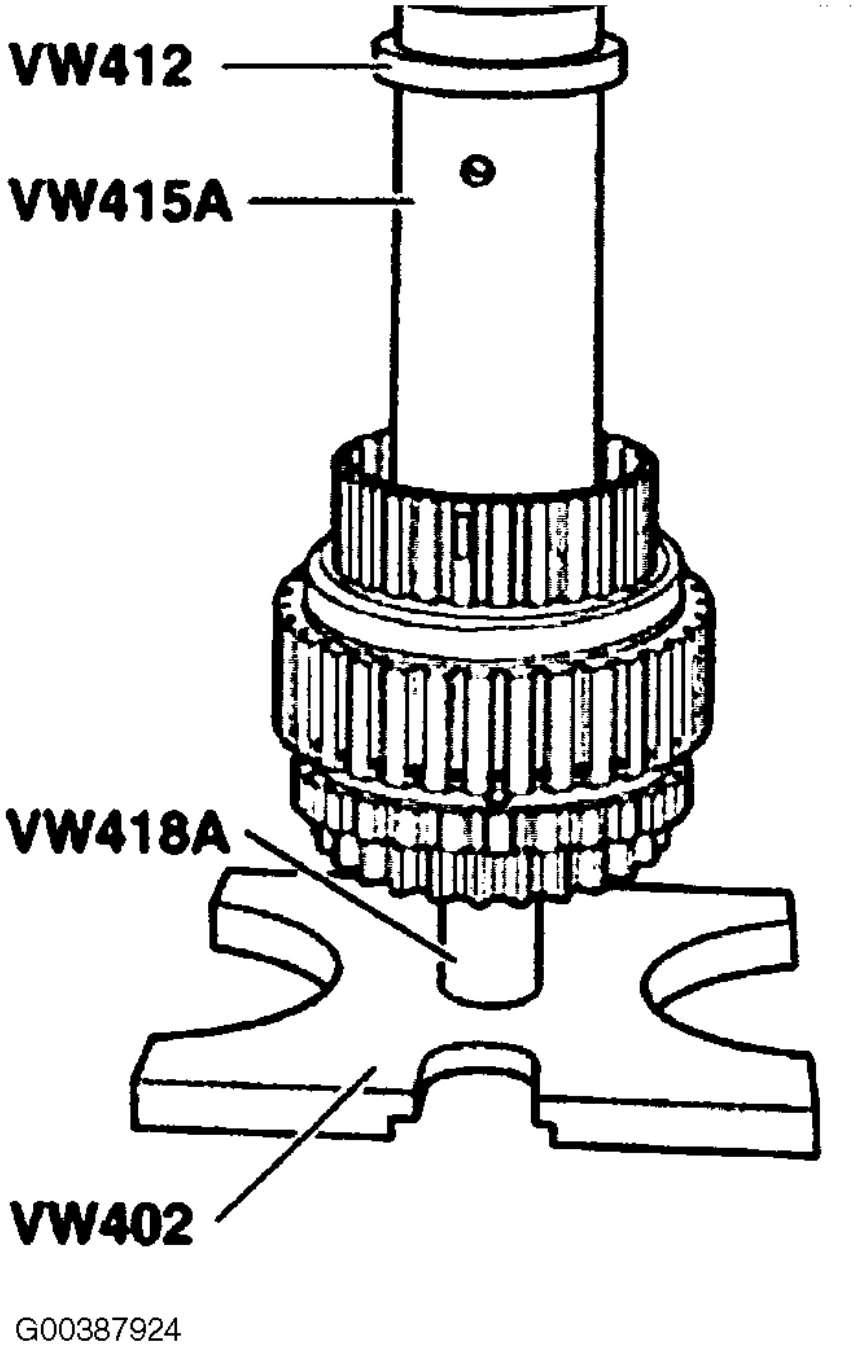

Fig. 68: Removing Ball Sleeve From Selector Mechanism Cover
Courtesy of VOLKSWAGEN OF AMERICA, INC.

- Before pulling out ball sleeve, destroy plastic cage and remove balls.

A. Internal extractor, e.g. Kukko 21/3, 18.5... 23.5 mm

Pressing ball sleeve into selector mechanism cover

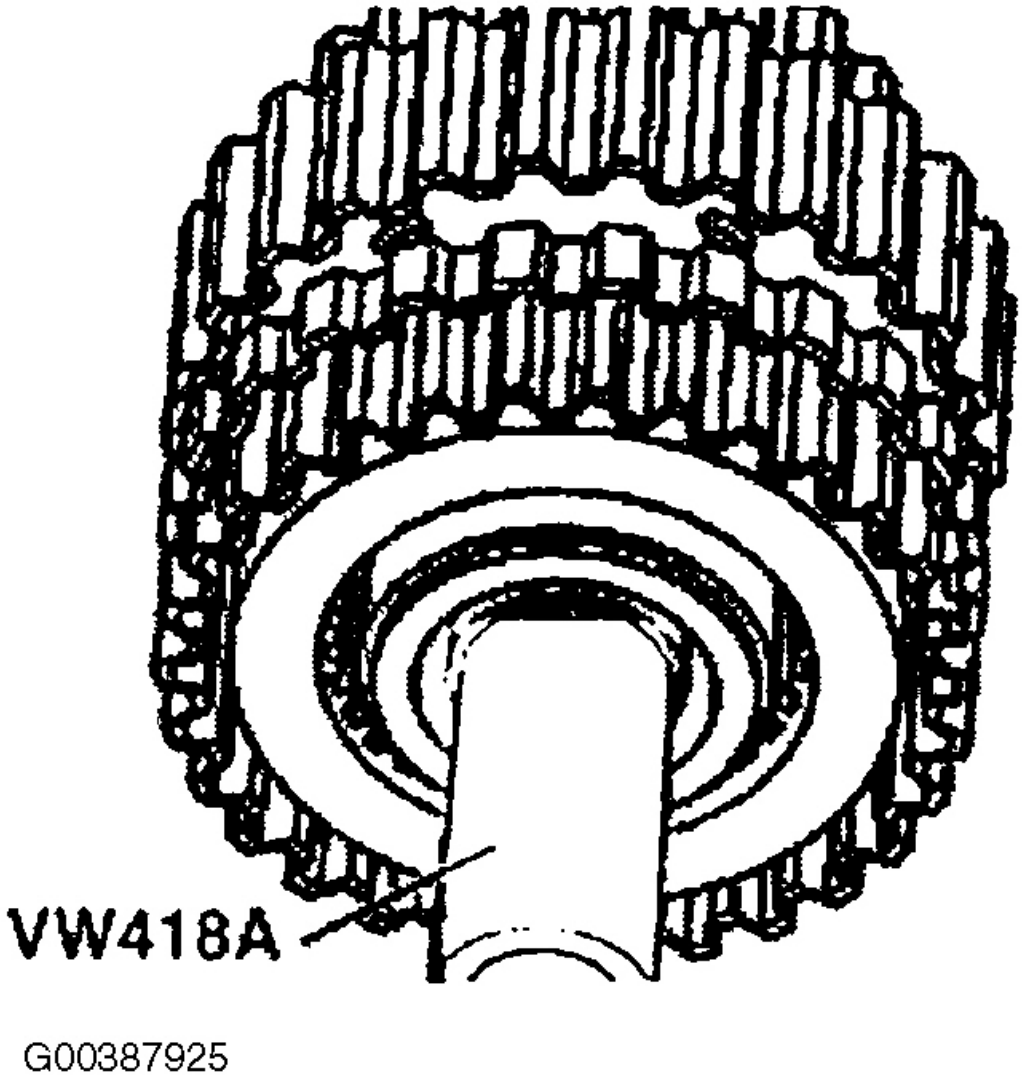

Fig. 69: Pressing Ball Sleeve Into Selector Mechanism Cover
Courtesy of VOLKSWAGEN OF AMERICA, INC.

Installing oil seal onto stop

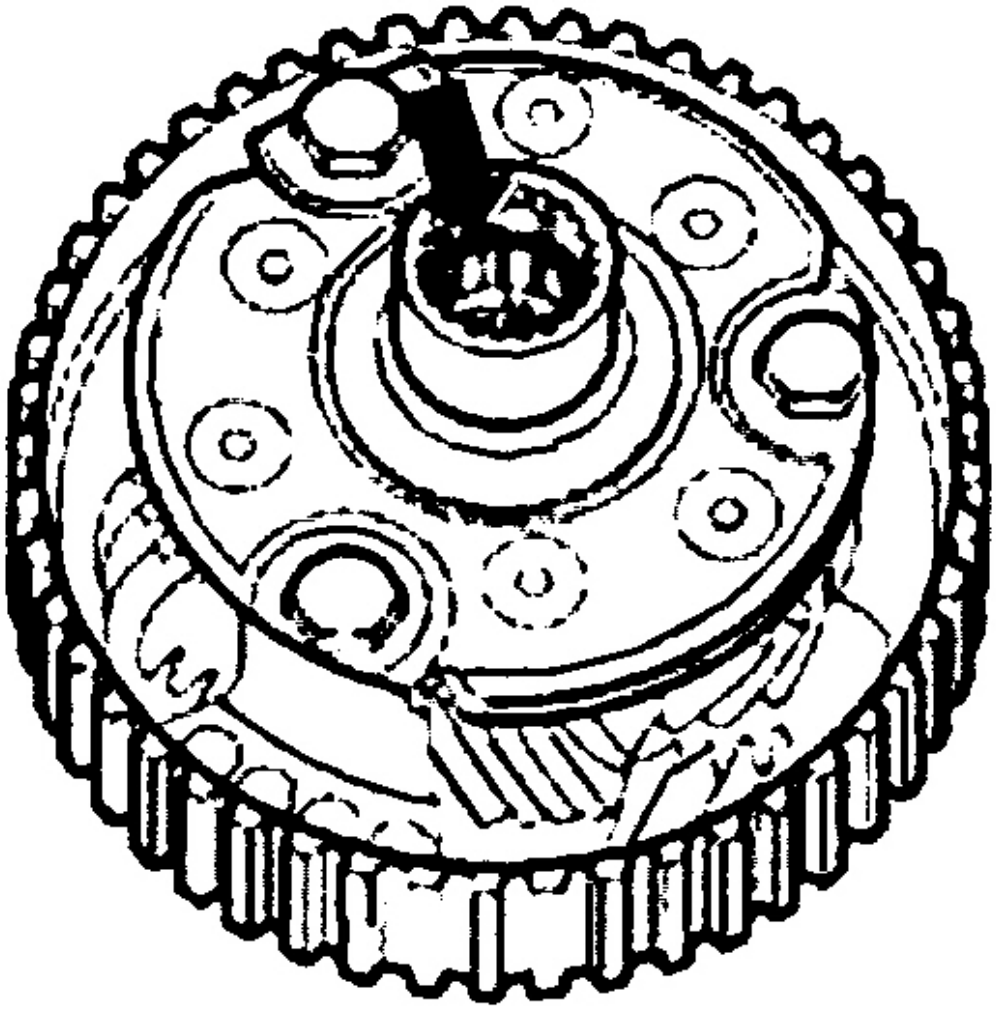

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Fig. 70: Installing Oil Seal Onto Stop
Courtesy of VOLKSWAGEN OF AMERICA, INC.

Selector mechanism cover and selector shaft changed

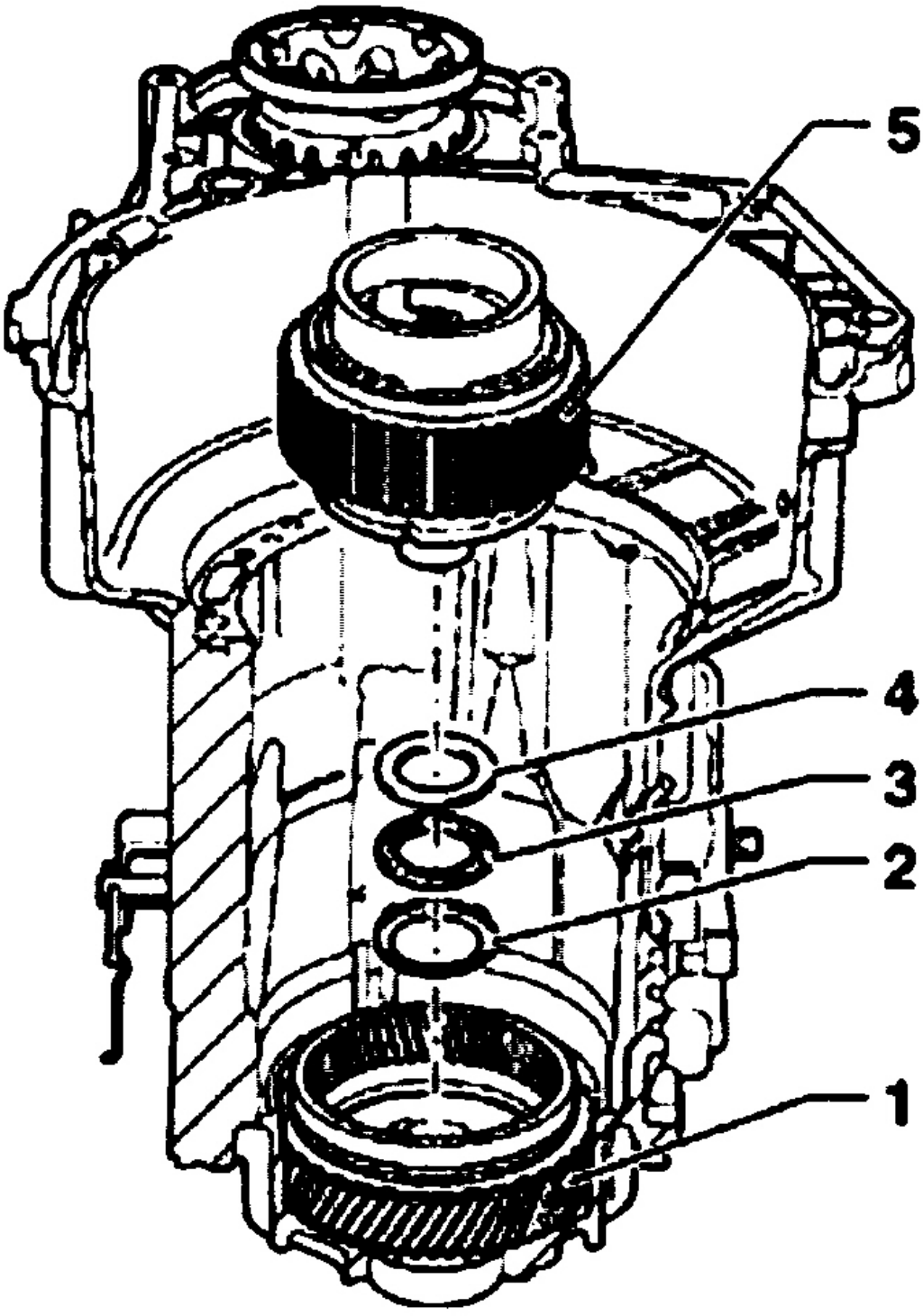

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Fig. 71: Installing Selector Mechanism Cover And Selector Shaft Changed
Courtesy of VOLKSWAGEN OF AMERICA, INC.

As of date of manufacture of September 4th 2000 the bolt -2- is installed into the selector mechanism cover -1-.

Tightening torque

15 N.m

The selector shaft locating sleeve has been equipped with the segment -3-.

Function

When shifting down from the 5th to 4th gear the bolt -2- guides the selector shaft via the segment -3- into the 4th gear gap.

Selector mechanism cover and selector shaft changed

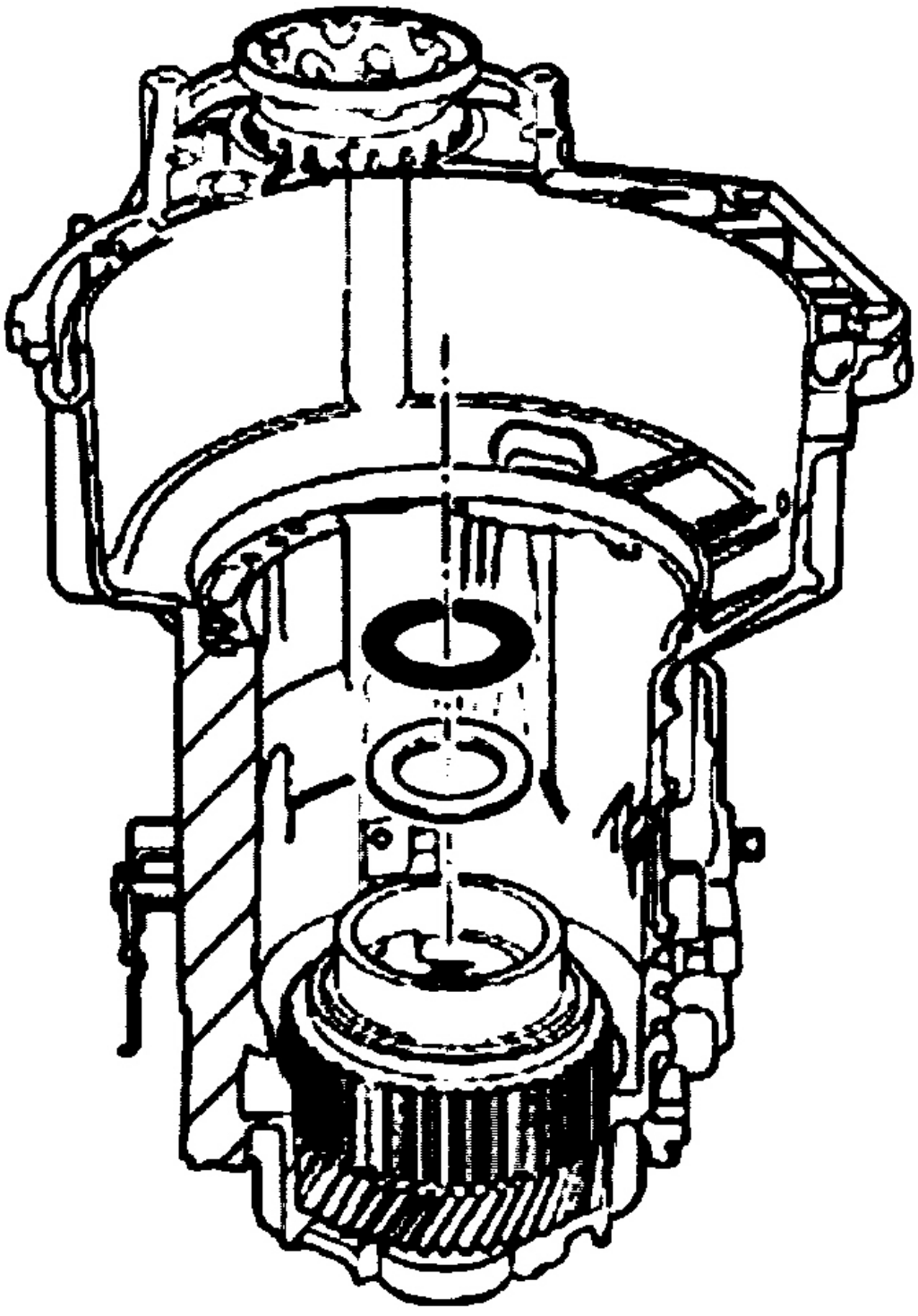

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Fig. 72: Changing Selector Mechanism Cover And Selector Shaft
Courtesy of VOLKSWAGEN OF AMERICA, INC.

As of date of manufacture of August 6th 2001 the selector shaft is manufactured with the recesses -A-.

The spring -B- is fitted in the selector mechanism cover.

Function

With one selected forward gear, the selector shaft is secured via one of the recesses -A- with the spring -B- in the selector mechanism cover.

SELECTOR FORKS, DISASSEMBLING AND ASSEMBLING

Special tools and equipment

- VW 402 Press plate
- 3290/1 Press piece from mounting device 3290
- 3301 Mounting device
- VW 431 Press piece
- VW 472/2 Spacer sleeve
- 10-206 Drift

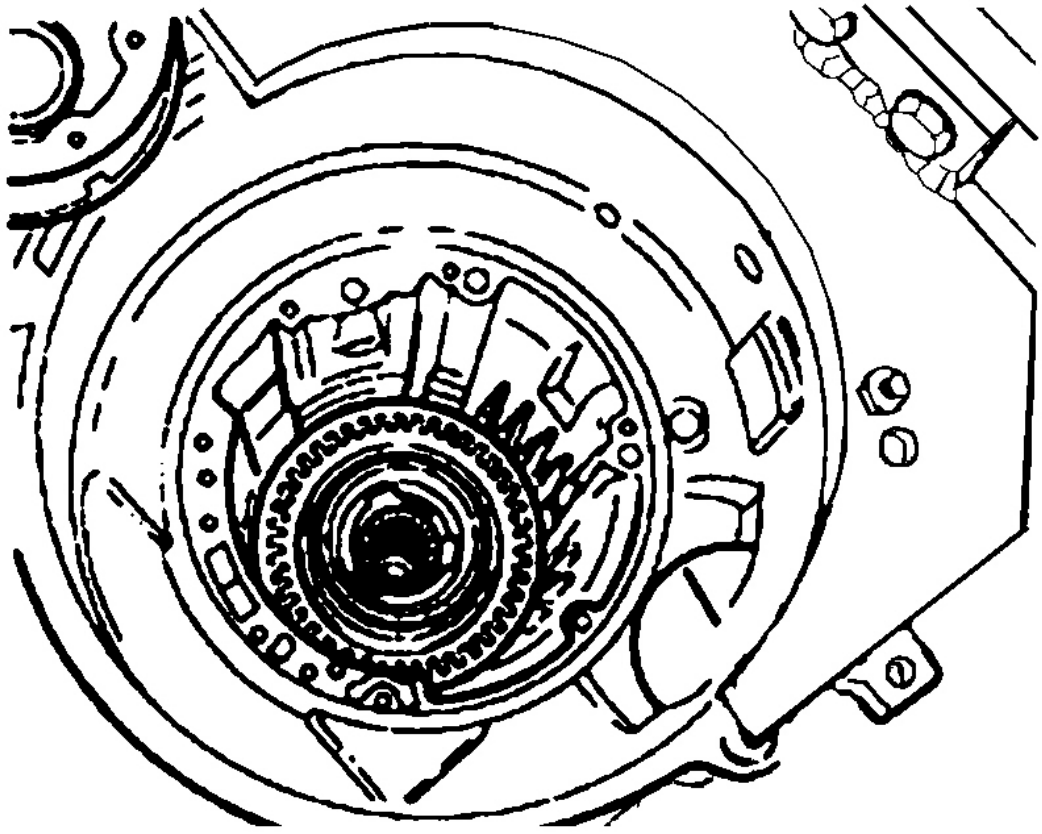

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Fig. 73: Identifying Special Tools And Equipment
Courtesy of VOLKSWAGEN OF AMERICA, INC.

- 80-200 Removal lever
- 10-508 Assembly mandrel
- 2070 Tensioning device

NOTE: The selector fork group (item 7) does not need disassembling and assembling the selector segments to disassemble the bearings and the circlips.

NOTE: The following list refers to items in Fig. 74 .

1. **Selector segment 5th gear**
   - Identification. See **Identifying Selector Segments**
   - After installing circlip selector segment must rotate freely

2. **Circlip**
    - Always replace
    - Removing. See **Installing circlip**
    - Installing. See **Installing circlip**
3. **5th gear selector fork**
    - Adjusting. See **ADJUSTING 5TH GEAR:**
4. **Bolt, 25 N.m**
5. **5th gear selector jaw**
6. **Bearing**
    - 4 Pieces
    - Removing. See **Removing bearing inner race**
    - Pressing inner ring into outer ring. See **Pressing Bearing Inner Ring Into Outer Ring**
    - Pressing in. See **Pressing Inner Race In Selector Fork Onto Stop**
7. **Selector fork group with selector rails**
8. **Selector segment 1st/2nd gear**
    - Identification. See **Identifying Selector Segments**
    - After installing the circlip the segment must rotate freely
9. **Selector segment 3rd/4th gear**
    - Identification. See **Identifying Selector Segments**
    - After installing the circlip the segment must rotate freely
10. **Domed sliding piece**
11. **Spring**
12. **Reverse gear selector fork**
13. **Support for reverse gear selector fork**
14. **Circlip**

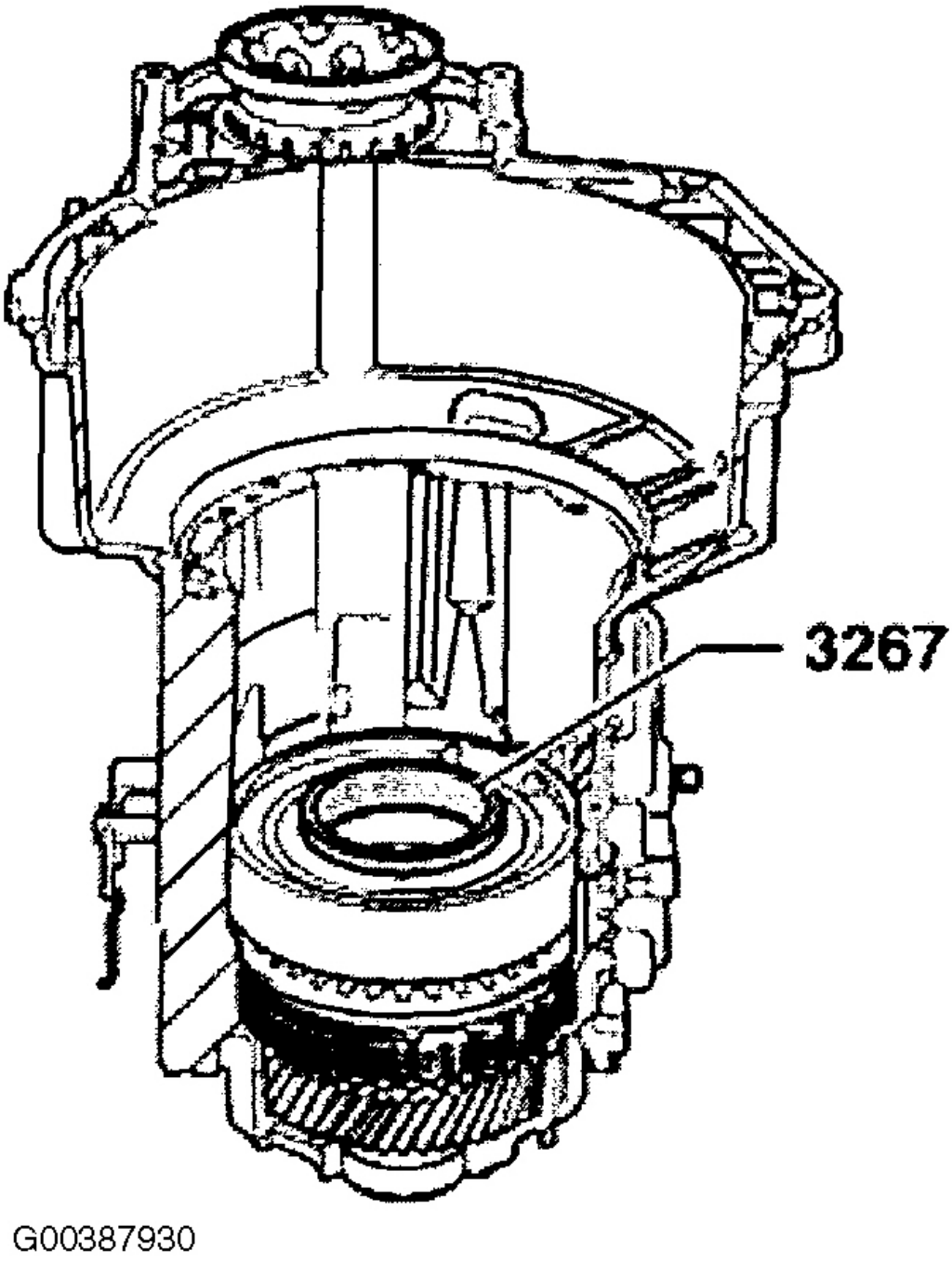

Fig. 74: Disassembling Selector Fork Assembly
Courtesy of VOLKSWAGEN OF AMERICA, INC.

Identifying Selector Segments

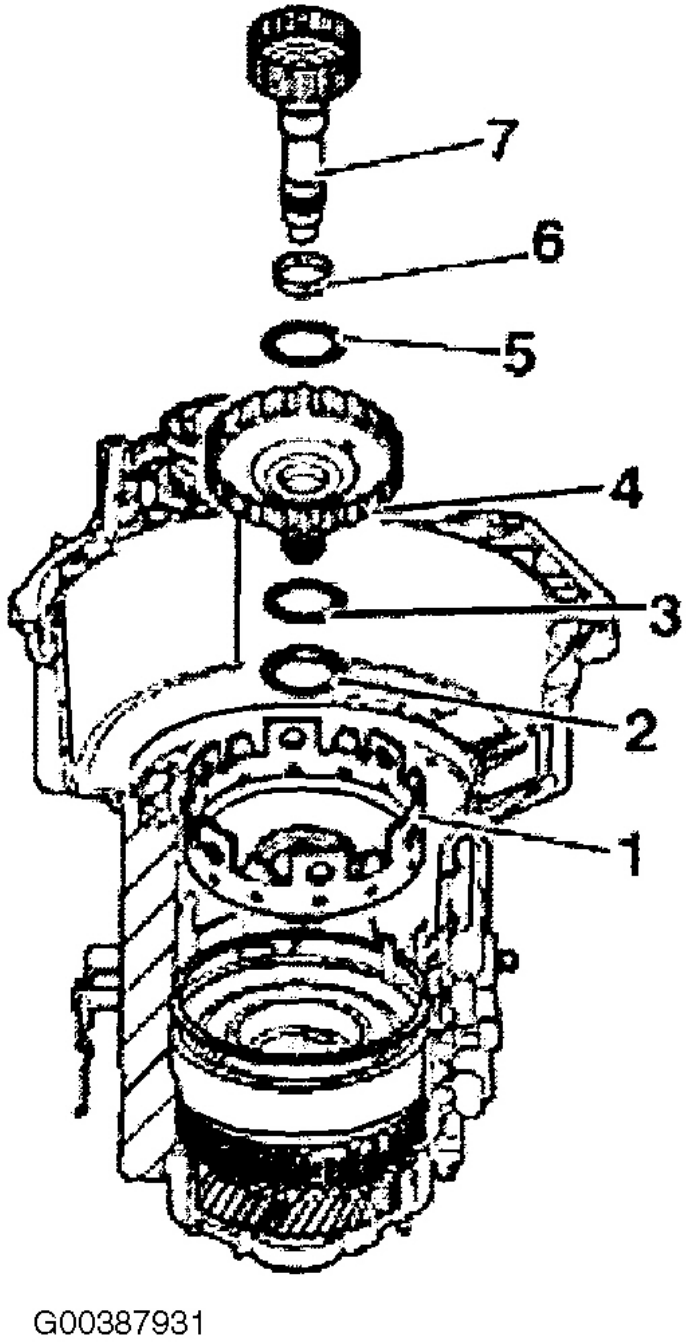

Fig. 75: Identifying Selector Segments
Courtesy of VOLKSWAGEN OF AMERICA, INC.

1. 1st and 2nd gear selector segments = 12.1 mm

   1st and 2nd gear selector segments with changed synchronization = 11.4 mm. See **Changed springs for 5th gear synchronizer from transmission manufacture date November 11 01**

   The shorter selector segments can be installed in previous transmissions.

2. 3rd and 4th gear selector segments = 7.7 mm
3. 5th gear selector segments = 12.1 mm

Removing circlip

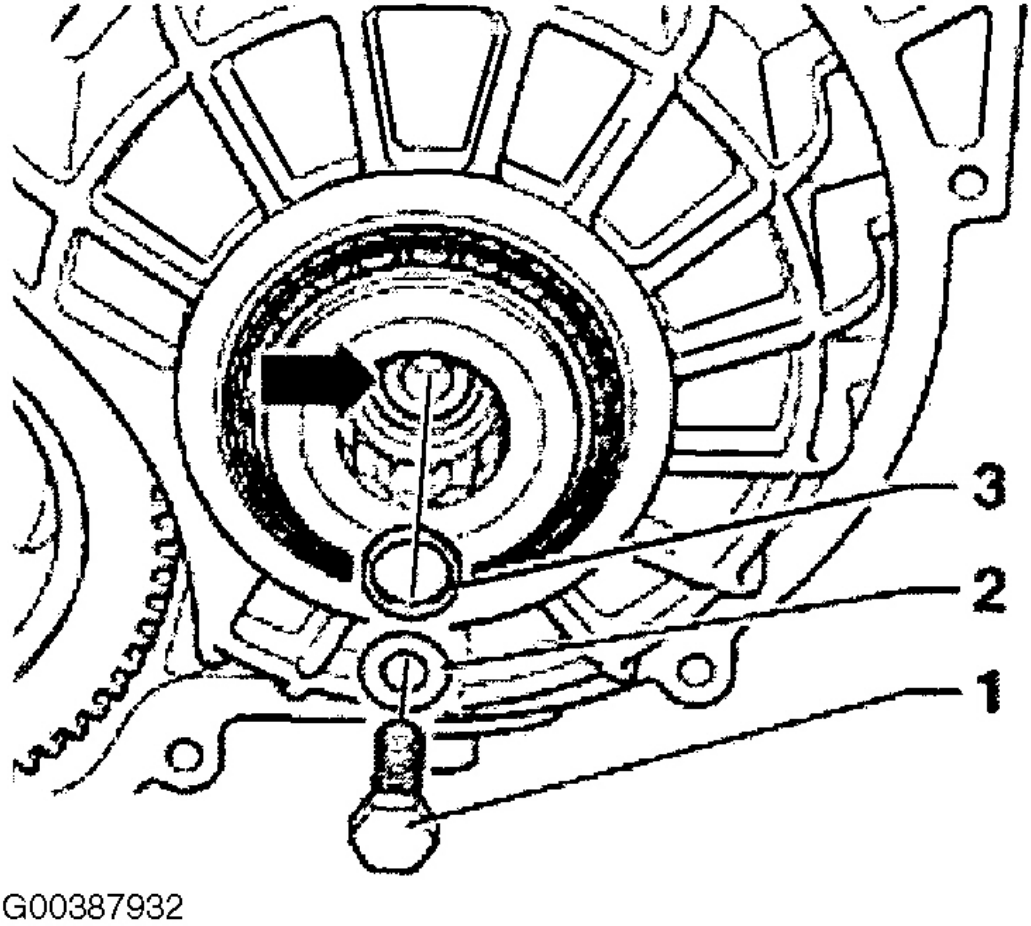

Fig. 76: Removing Circlip
Courtesy of VOLKSWAGEN OF AMERICA, INC.

- Tighten selector fork into screwed stick with the vice clamps -B-.
- Pry circlip in direction of arrow -A-.

Installing circlip

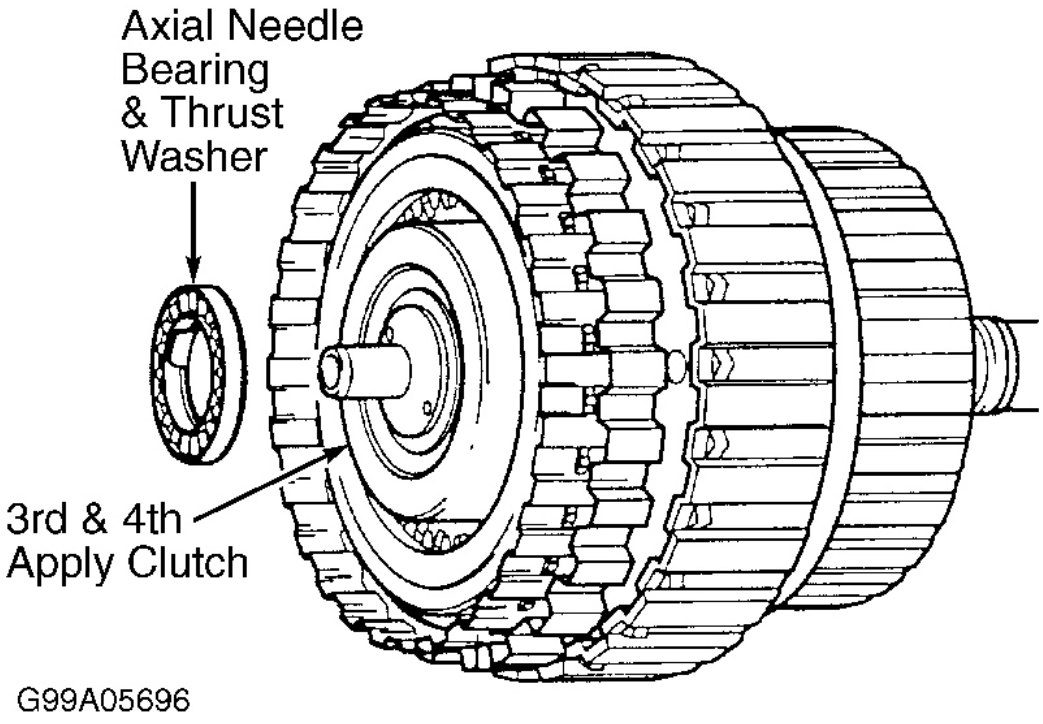

Fig. 77: Installing Circlip
Courtesy of VOLKSWAGEN OF AMERICA, INC.

- Press circlip into selector segment groove with socket.

NOTE: After installing the circlip the selector segment must rotate freely.

A. Socket driver, 10 mm A/F
B. Vice clamps

Removing bearing inner race

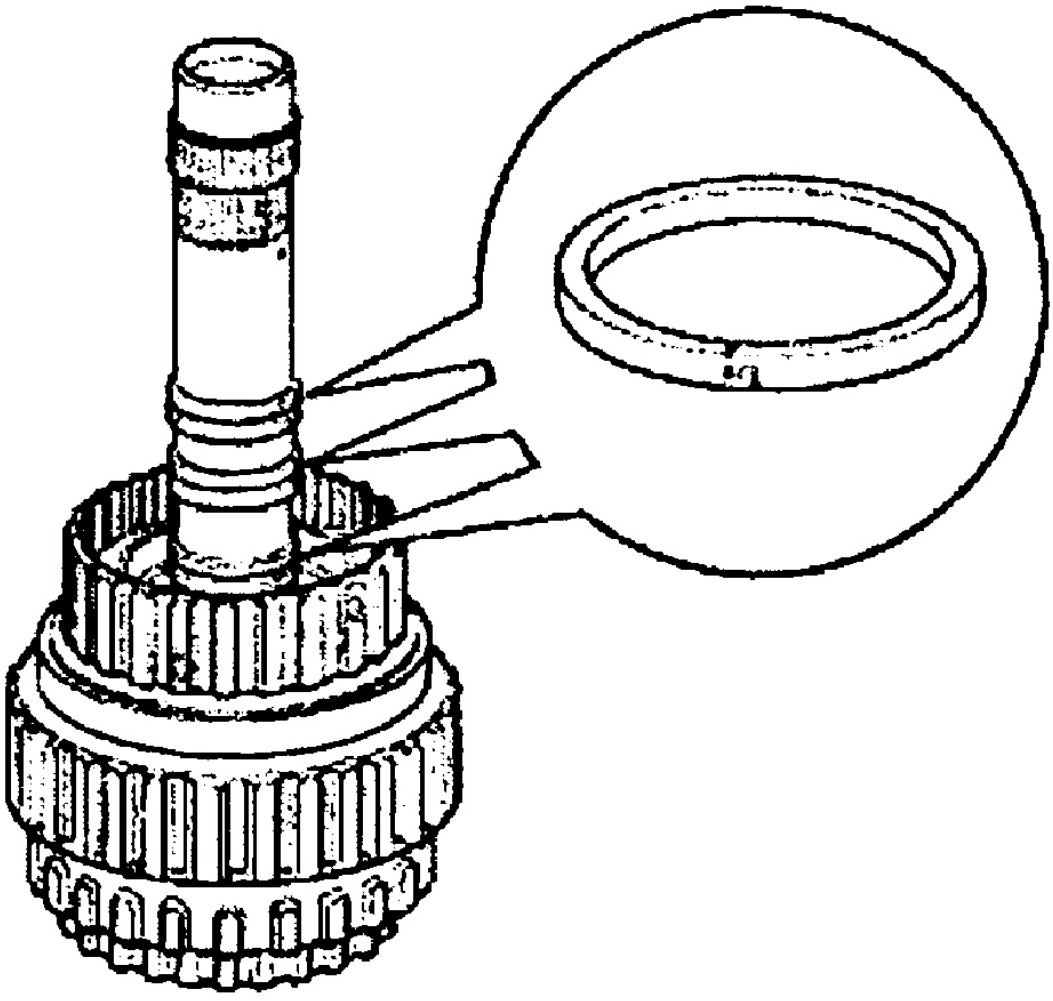

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Fig. 78: Removing Bearing Inner Race
Courtesy of VOLKSWAGEN OF AMERICA, INC.

NOTE: When removing and installing the inner races do not bend selector forks.

Pressing Bearing Inner Ring Into Outer Ring

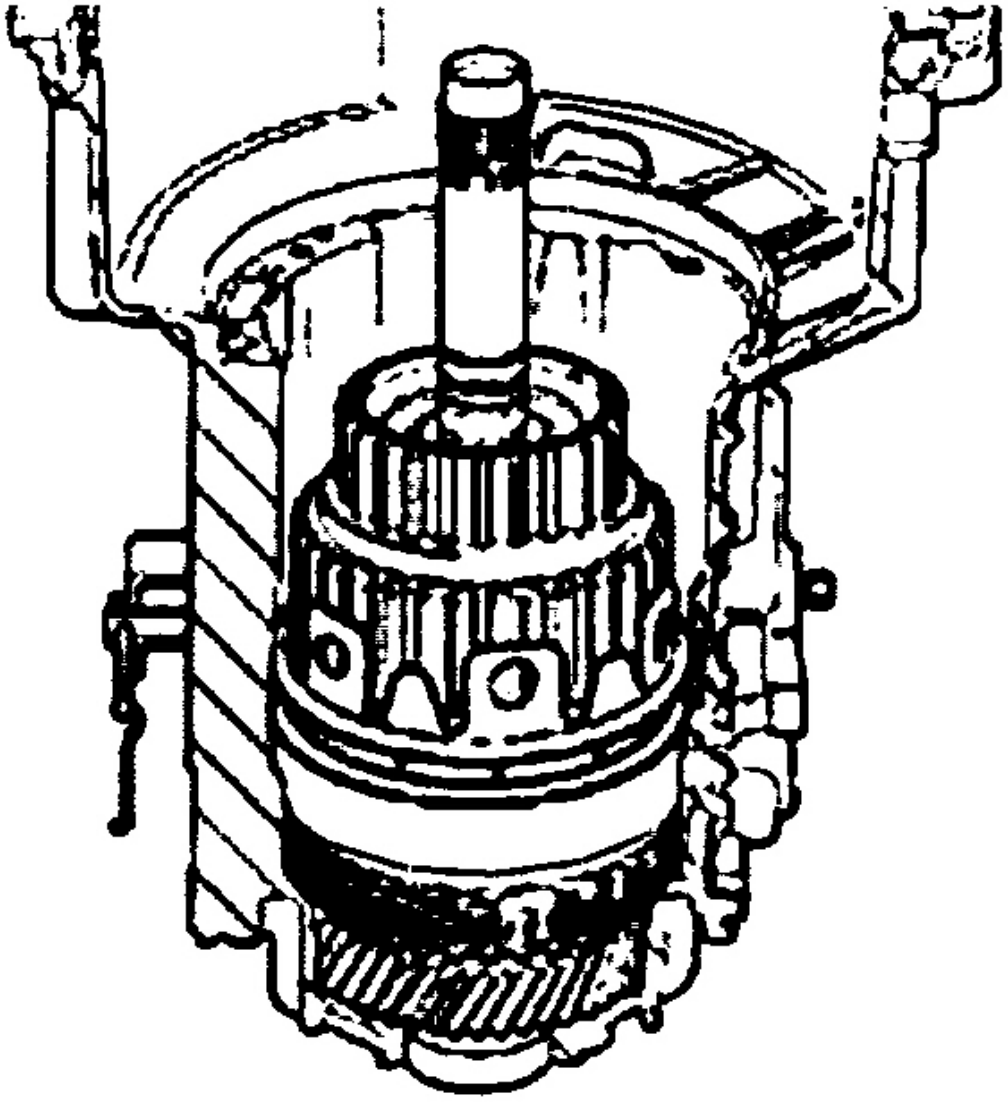

Fig. 79: Pressing Bearing Inner Ring Into Outer Ring
Courtesy of VOLKSWAGEN OF AMERICA, INC.

The inner ring must secure with the outer ring.

Pressing Inner Race In Selector Fork Onto Stop

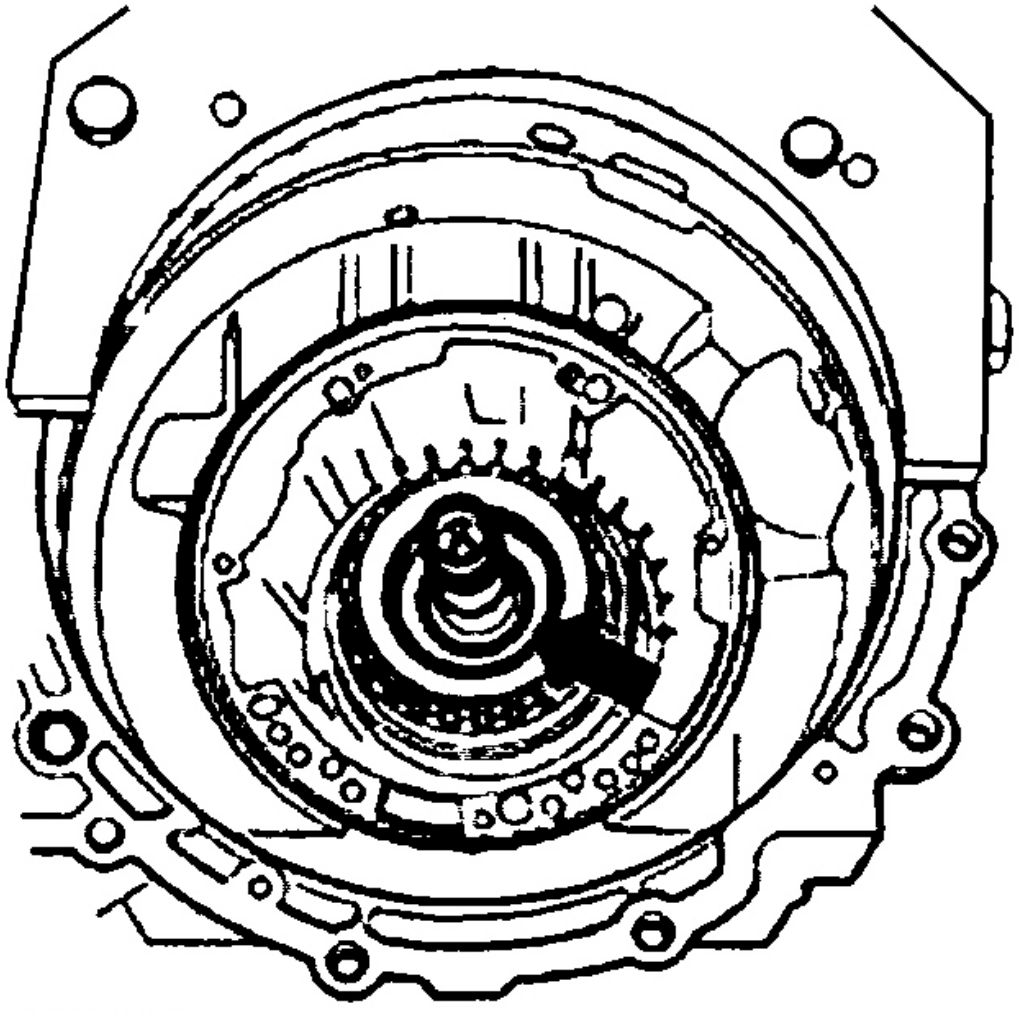

Fig. 80: Pressing Inner Race In Selector Fork Onto Stop
Courtesy of VOLKSWAGEN OF AMERICA, INC.

The hollow in press piece 3290/1 points to bearing.

Selector Fork With Selector Segments Installed

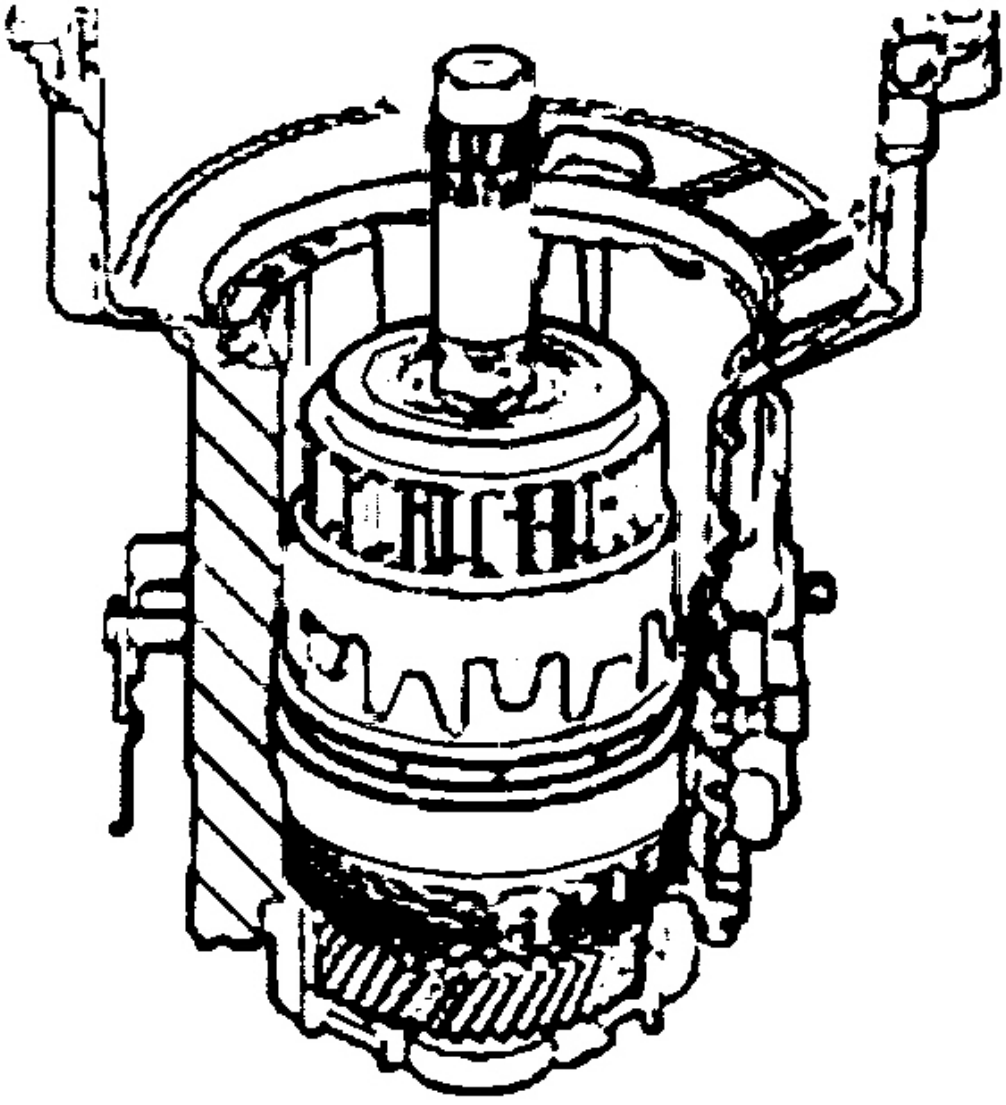

Fig. 81: Installing Selector Fork With Selector Segments
Courtesy of VOLKSWAGEN OF AMERICA, INC.

Selector Fork Measurements

Application	(1) Dim. -a- (mm)
1st/2nd gear selector fork	87.2 ... 87.9

1st and 2nd gear selector segments with changed synchronization. See **Changed springs for 5th gear synchronizer from transmission manufacture date November 11 01**	88.4 ... 89.1
3rd/4th gear selector forks	96.0 ... 96.7
(1) For dimension a, see **Fig. 81** .	

Selector segment assignment. See **Identifying Selector Segments** .

MANUAL TRANSMISSION - GEARS, SHAFTS

INPUT SHAFT, DISASSEMBLING AND ASSEMBLING

Special tools and equipment

- VW 407 H Press tool
- VW 447 H Press plate
- VW412 Press tool
- VW 422 Tube
- VW 401 Press plate
- VW 408 A Press tool

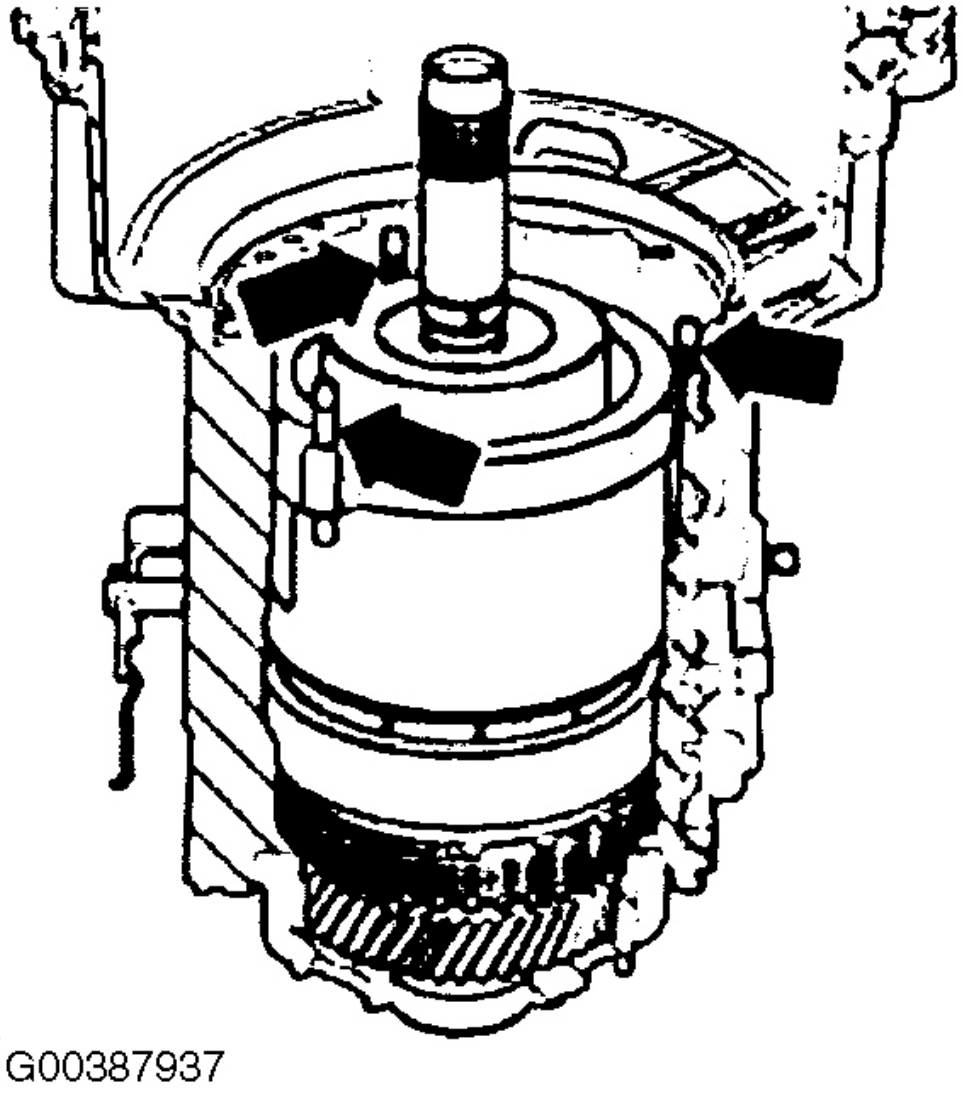

Fig. 82: Identifying Special Tools And Equipment (1 Of 2)
Courtesy of VOLKSWAGEN OF AMERICA, INC.

- VW 421 Tube
- VW 454 Press piece
- VW 447 i Thrust plate
- VW510 Press piece
- 41-501 Drift sleeve

- 3-Kukko 17/1 Separating device

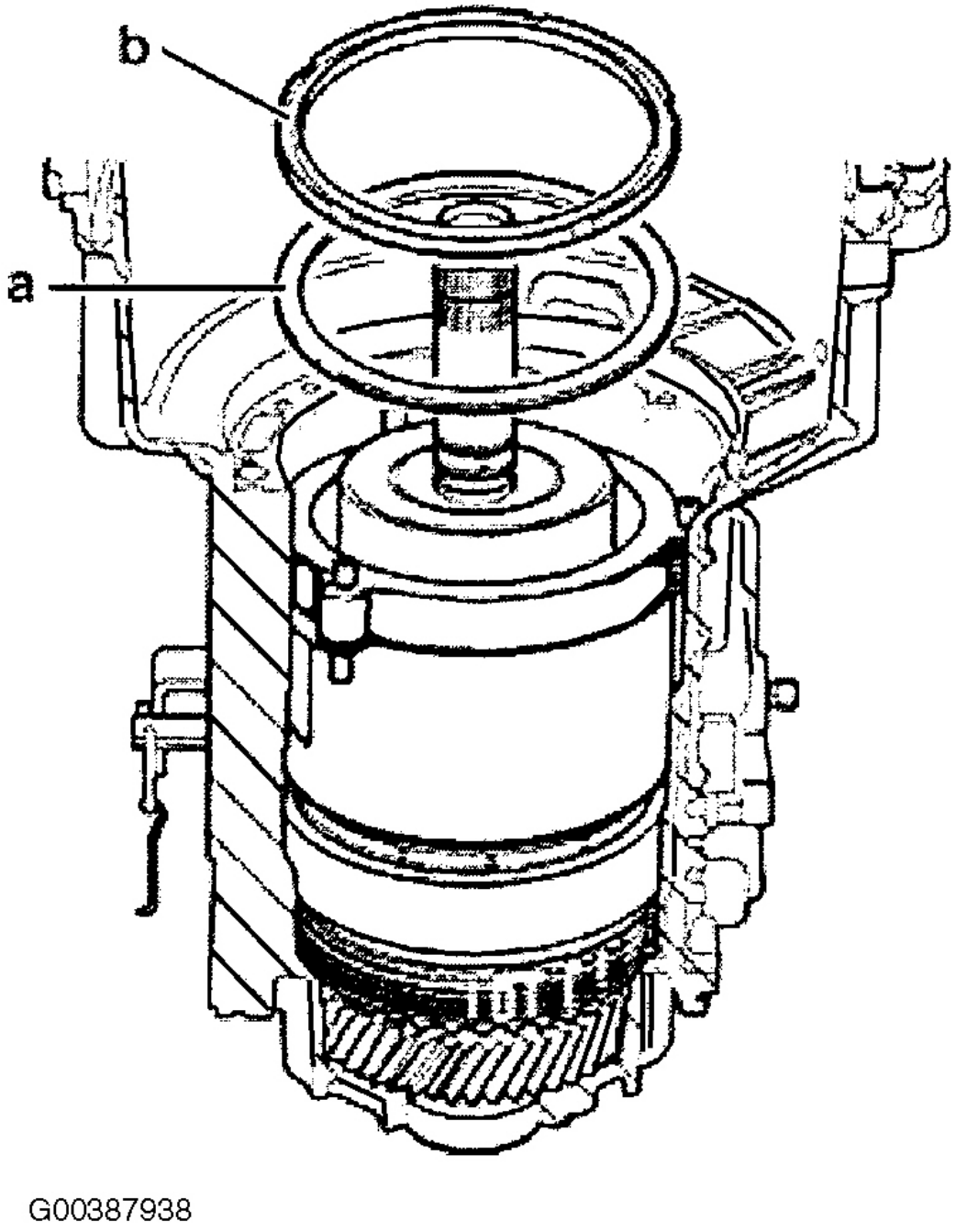

Fig. 83: Identifying Special Tools And Equipment (2 Of 2)
Courtesy of VOLKSWAGEN OF AMERICA, INC.

NOTE:

- **When installing new gear wheels, consult technical data. See Code letters, transmission application, ratios, capacities .**
- **If the position of the tapered roller bearings is affected when exchanging parts, the input shaft must be readjusted. See adjustment overview. See Adjustment overview .**

NOTE: The following list refers to items in Fig. 84 .

1. **Clutch housing**
2. **Tapered roller bearing outer race**
   - Removing. See **Pressing out tapered roller bearing outer race**
   - Pressing in. See **Pressing in tapered roller bearing outer race**
3. **Tapered roller bearing inner race**
   - Pressing off. See **Pressing off tapered roller bearing inner race** .
   - Pressing on **Pressing on tapered roller bearing inner race** .
4. **Input shaft**
   - Adjusting. See **INPUT SHAFT, ADJUSTING**
5. **3rd gear wheel**
   - Shoulder points to 4th gear
   - Pressing off. See **Pressing off 4th gear wheel with tapered roller bearing and sleeve**
   - Pressing on **Pressing on 3rd gear wheel**
6. **Circlip**
   - Always replace
7. **4th gear wheel**
   - Press off with tapered roller bearing inner race and sleeve. See **Pressing off 4th gear wheel with tapered roller bearing and sleeve**
   - Pressing on **Pressing on 4th gear wheel**
   - Collar faces to 3rd gear
8. **Tapered roller bearing inner race**
   - Pressing off with 4th gear wheel and sleeve. See **Pressing off 4th gear wheel with tapered roller bearing and sleeve**
   - Pressing on **Pressing on tapered roller bearing inner race**
9. **Thrust washer**
10. **Tapered roller bearing outer race**
    - Pressing out **Pressing out tapered roller bearing outer race**
    - Pressing in. See **Pressing in tapered roller bearing outer race**
11. **Shim**
    - Determining thickness adjusting input shaft. See **INPUT SHAFT, ADJUSTING**

12. **Transmission housing**
13. **Sleeve**
    - For needle roller bearing
    - Press off with 4th gear wheel and tapered roller bearing inner race. See **Pressing off 4th gear wheel with tapered roller bearing and sleeve**
    - Pressing on **Pressing on tapered roller bearing inner race**
    - Place thrust washer on before installing (item 9)
14. **Needle roller bearing**
15. **5th gear wheel**
    - Pull off together with 5th gear synchro-hub. See **Assembly sequence**
16. **5th gear synchro-ring**
    - With cast locking pieces. See **5th gear synchro-ring with cast locking pieces (arrows)**
    - Check for wear. See **Checking 5th gear synchro-ring**
17. **Spring**
    - Installation position. See **Assembling 5th gear locking collar/synchro-hub**
    - From transmission manufacture date November 05 01 the spring was changed. See **CHANGED SPRINGS FOR 5TH GEAR SYNCHRONIZER FROM TRANSMISSION MANUFACTURE DATE NOVEMBER 11 01**
18. **Lock pieces (Qty. 3)**
    - Installation position. See **5th gear synchronizer**
    - From transmission manufacture date March 05 01 are lock pieces installed, which are inner hollow
19. **5th gear synchro-hub**
    - Removing and installing. See **Assembly sequence**
20. **5th gear locking collar**
    - Removing and installing. See **Assembly sequence**
21. **Dished washer**
    - Installation position. See **Installation position of dished spring for gear wheel and 5th gear synchro-hub securing bolts:**
22. **Torx socket head bolt M 10, 80 N.m**
    - Installed piece on bolt head locates dished spring. See **Installation position of dished spring for gear wheel and 5th gear synchro-hub securing bolts:**

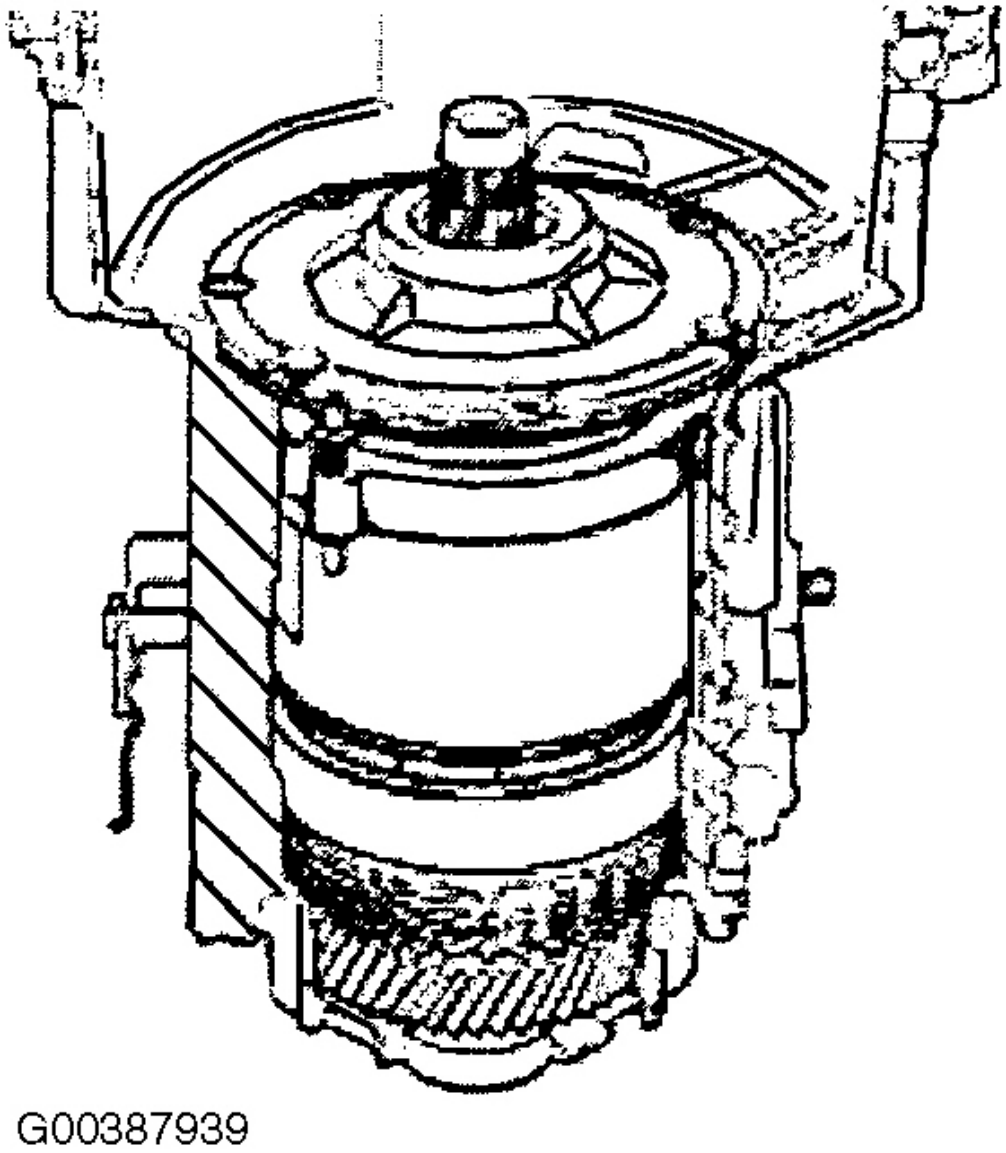

Fig. 84: Disassembling Input Shaft Assembly
Courtesy of VOLKSWAGEN OF AMERICA, INC.

Pressing out tapered roller bearing outer race

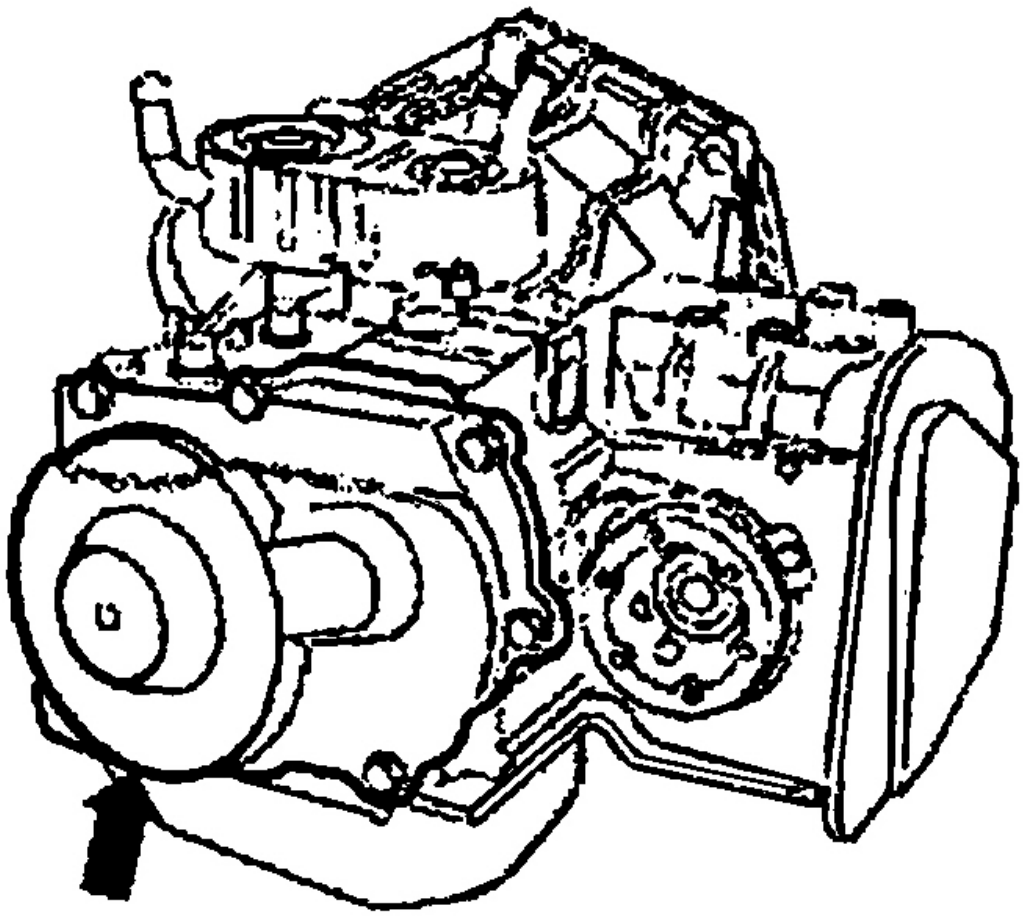

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Fig. 85: Pressing Out Tapered Roller Bearing Outer Race
Courtesy of VOLKSWAGEN OF AMERICA, INC.

Pressing in tapered roller bearing outer race

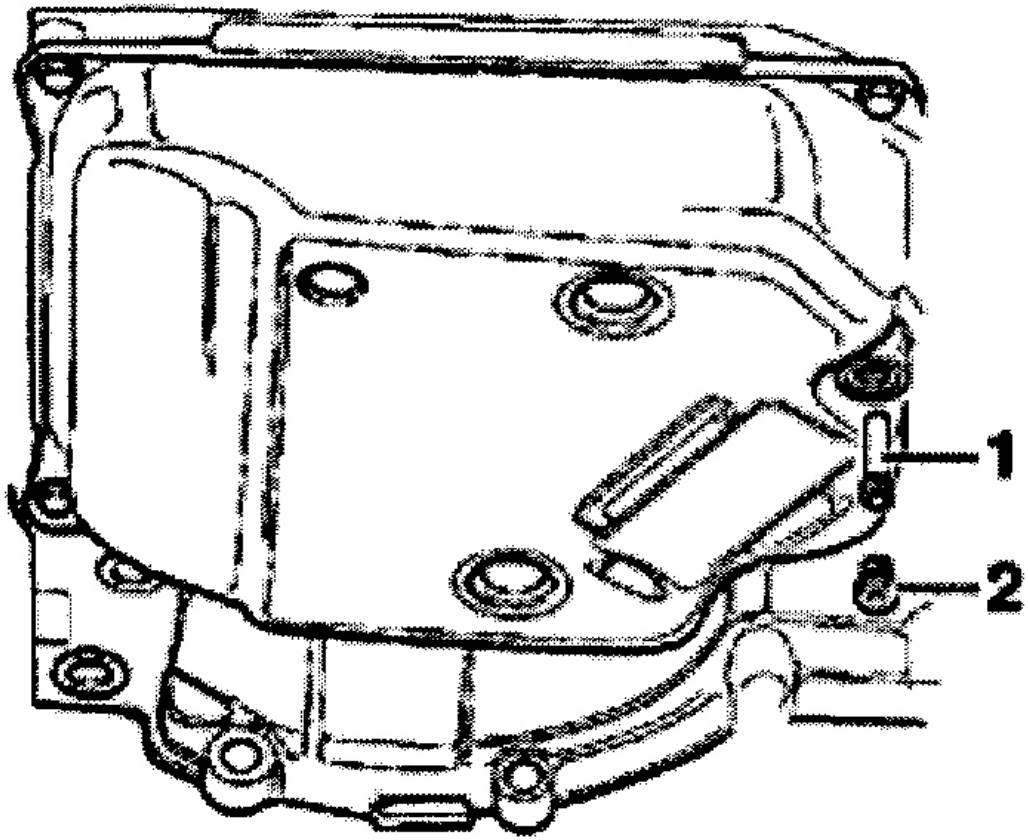
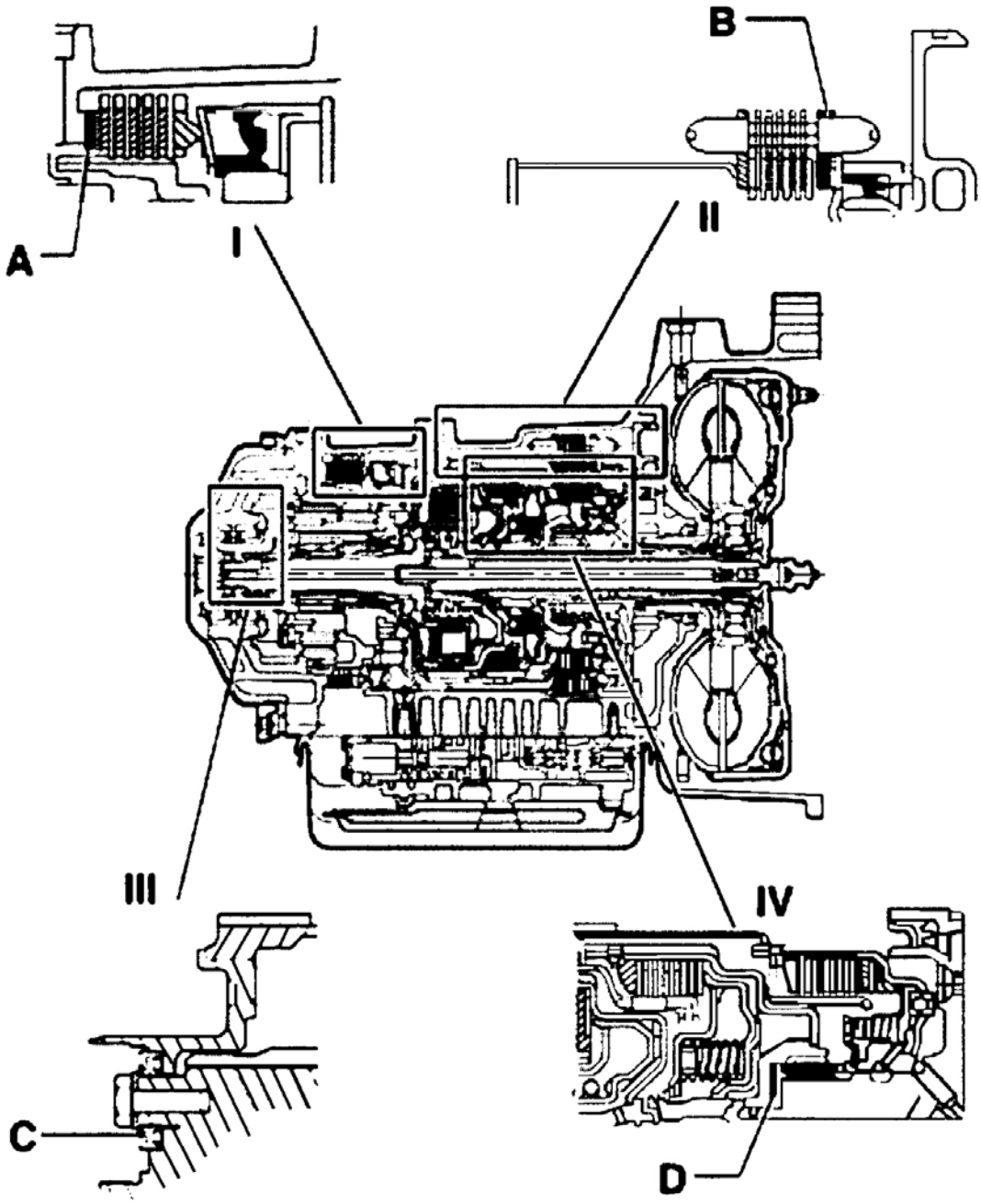


Fig. 86: Pressing In Tapered Roller Bearing Outer Race
Courtesy of VOLKSWAGEN OF AMERICA, INC.

Pressing off tapered roller bearing inner race



I = Reverse gear brake -B1-

- A - Shim

II = 2nd and 4th gear brake -B2-

- B - Outer plate or shim

III = Planet carrier

- C - Shim

IV = Clutch play

- D - Shim

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Fig. 87: Pressing Off Tapered Roller Bearing Inner Race
Courtesy of VOLKSWAGEN OF AMERICA, INC.

A. Separating device Kukko 17/1

Pressing on tapered roller bearing inner race

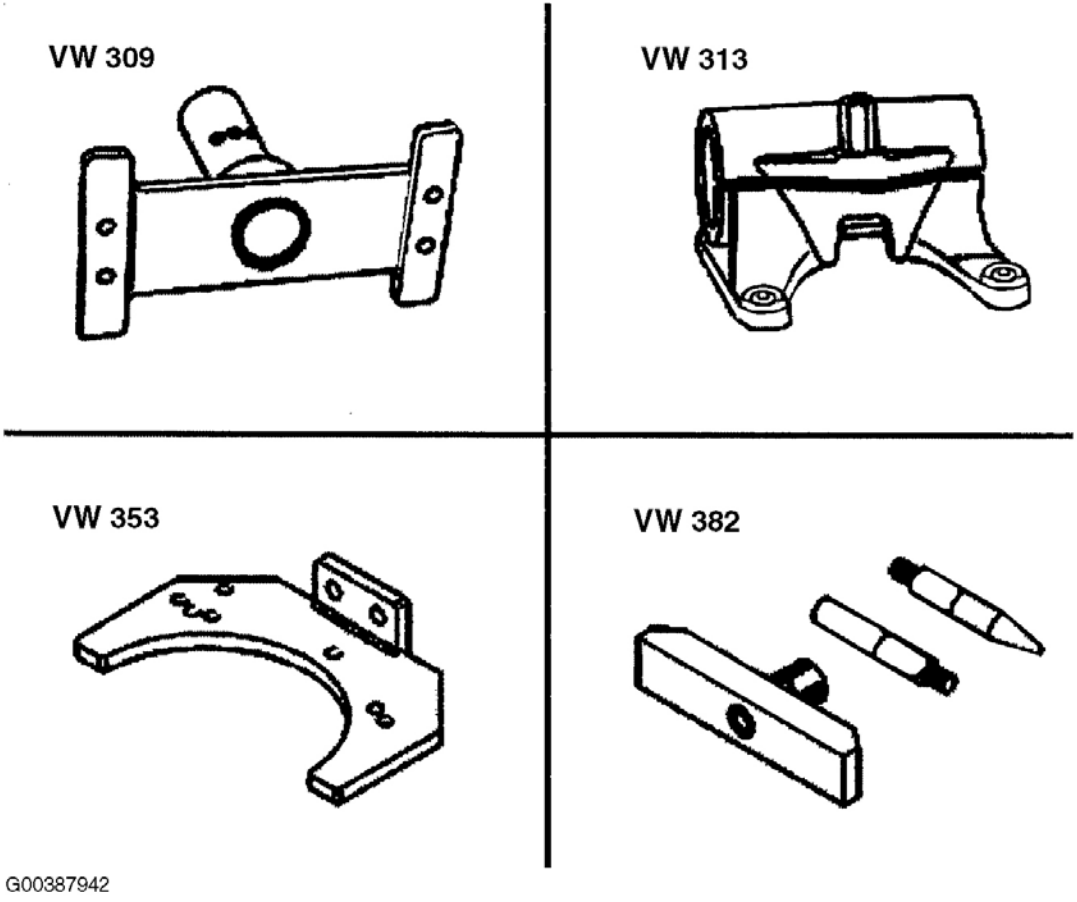
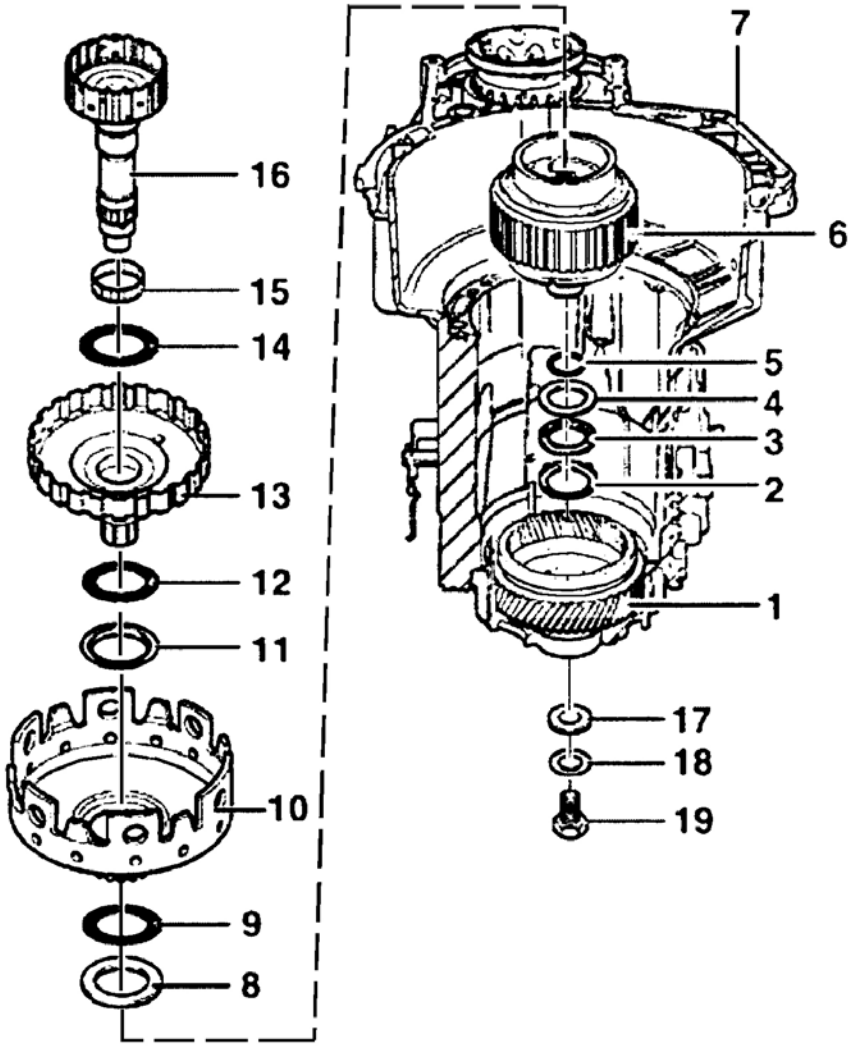


Fig. 88: Pressing On Tapered Roller Bearing Inner Race
Courtesy of VOLKSWAGEN OF AMERICA, INC.

Pressing off 4th gear wheel with tapered roller bearing and sleeve



Overview of components to adjust planet carrier

- When adjusting planet carrier install components in transmission housing without shim (item - 17 -).

1 - Input gear

- Do not remove to adjust planet carrier

2 - Axial needle bearing washer

- Insert smooth side in input gear

3 - Axial needle bearing

4 - Axial needle bearing washer

5 - O-ring

6 - Planet carrier

7 - Transmission housing

- With input gear and axial needle bearing
- Axial needle bearing remains in input gear

8 - Washer

9 - Axial needle bearing

10 - Large sun gear

11 - Washer

12 - Axial needle bearing

13 - Large drive shaft

14 - Axial needle bearing

15 - Needle bearing

16 - Small drive shaft

17 - Shim

- Do not install in planet carrier when adjusting

18 - Washer

19 - Small drive shaft bolt, 30 Nm

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Fig. 89: Pressing Off 4th Gear Wheel With Tapered Roller Bearing And Sleeve
Courtesy of VOLKSWAGEN OF AMERICA, INC.

Pressing off 3rd gear wheel

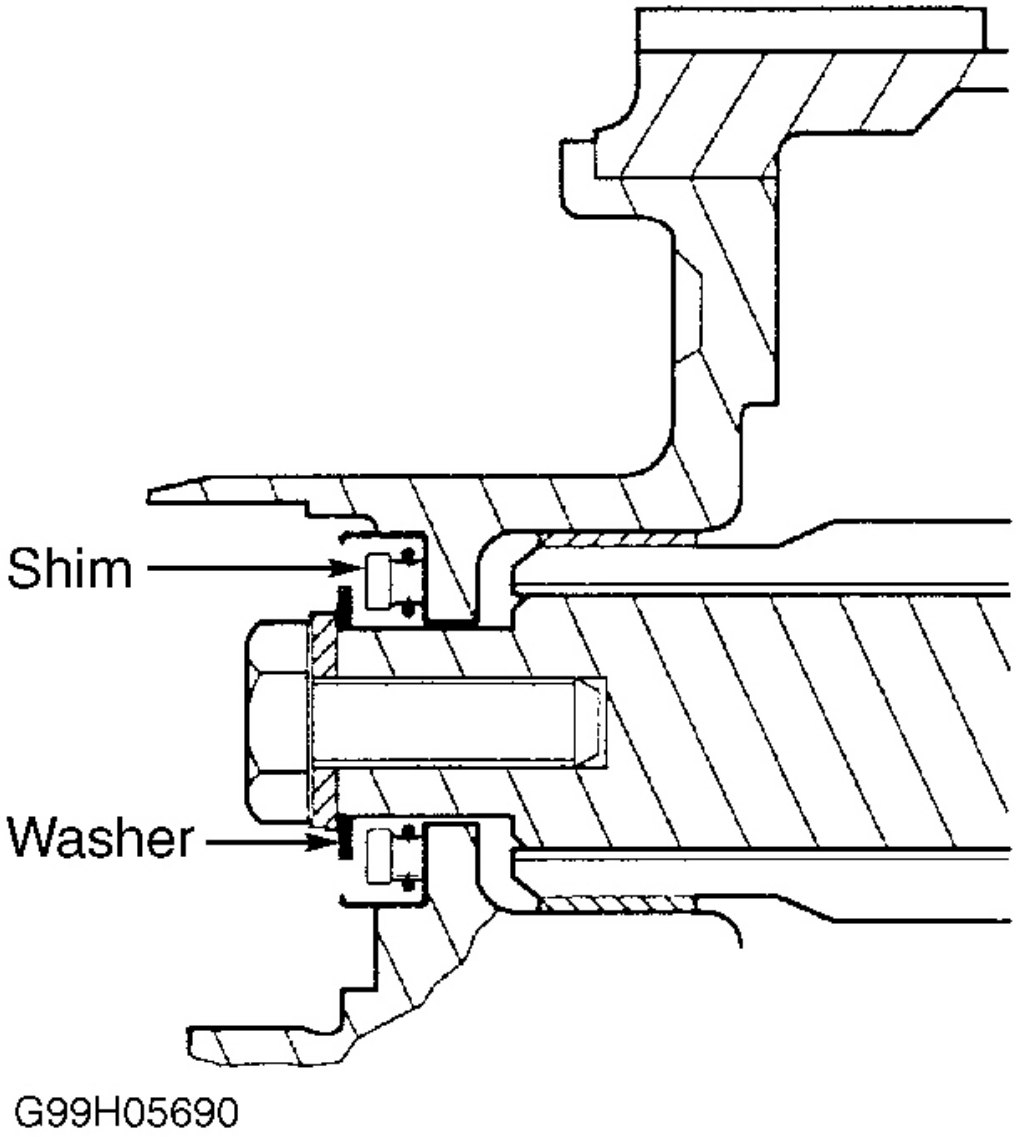


Fig. 90: Pressing Off 3rd Gear Wheel
Courtesy of VOLKSWAGEN OF AMERICA, INC.

Pressing on 3rd gear wheel

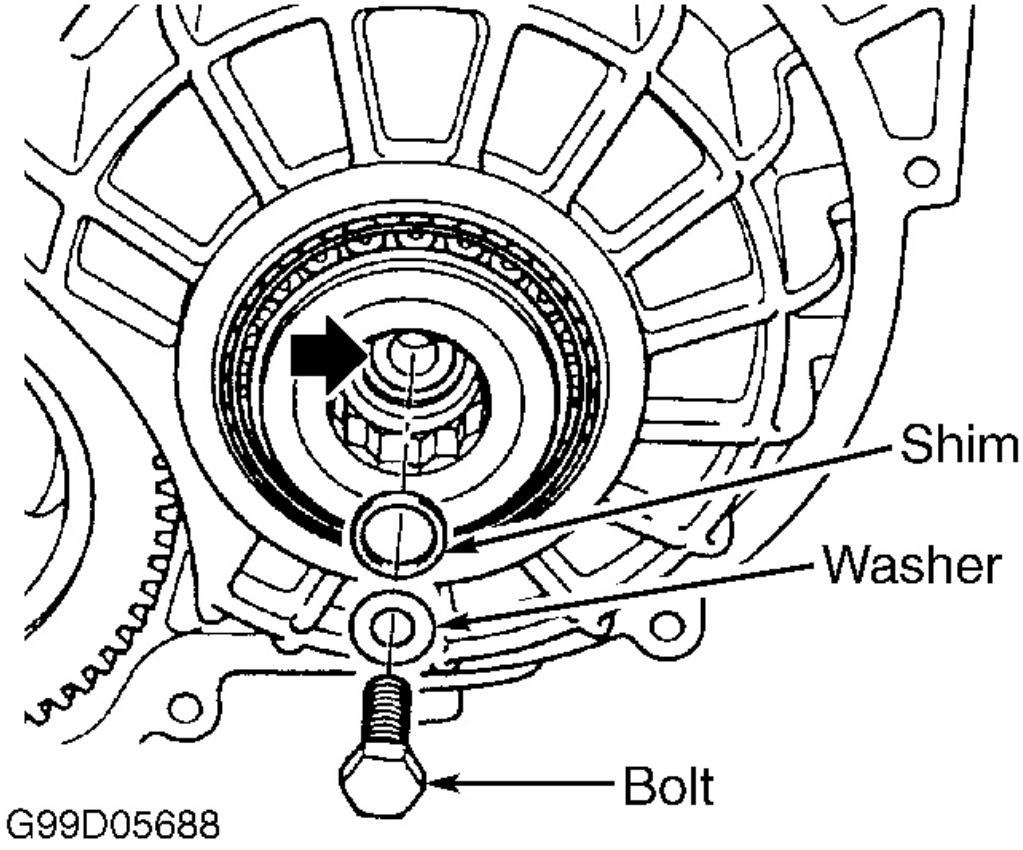


Fig. 91: Pressing On 3rd Gear Wheel
Courtesy of VOLKSWAGEN OF AMERICA, INC.

Pressing on 4th gear wheel

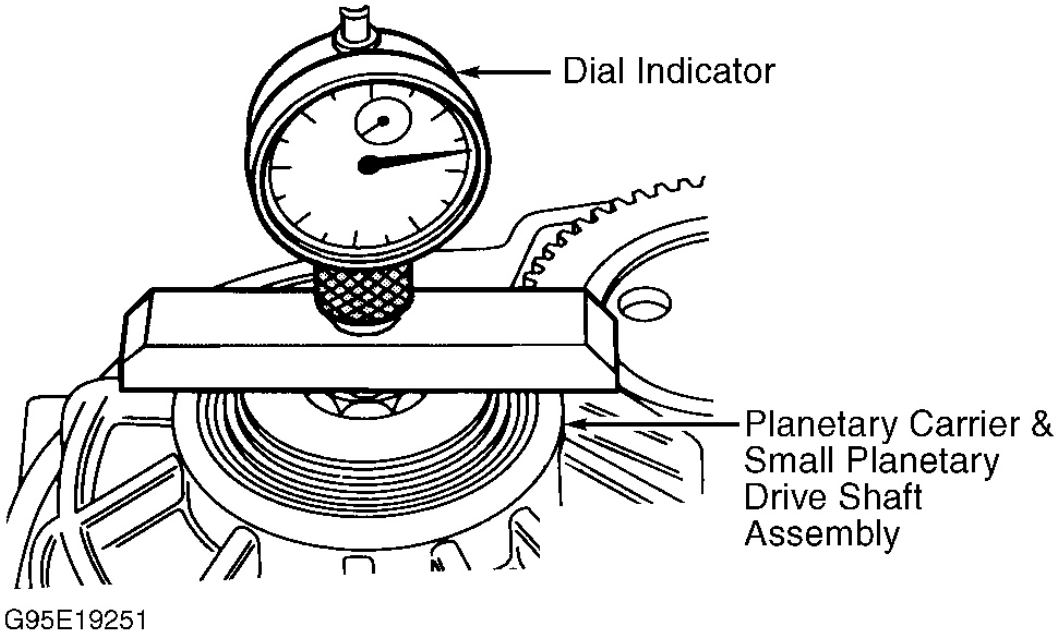


Fig. 92: Pressing On 4th Gear Wheel
Courtesy of VOLKSWAGEN OF AMERICA, INC.

Shoulder points to 3rd gear.

Pressing on tapered roller bearing inner race

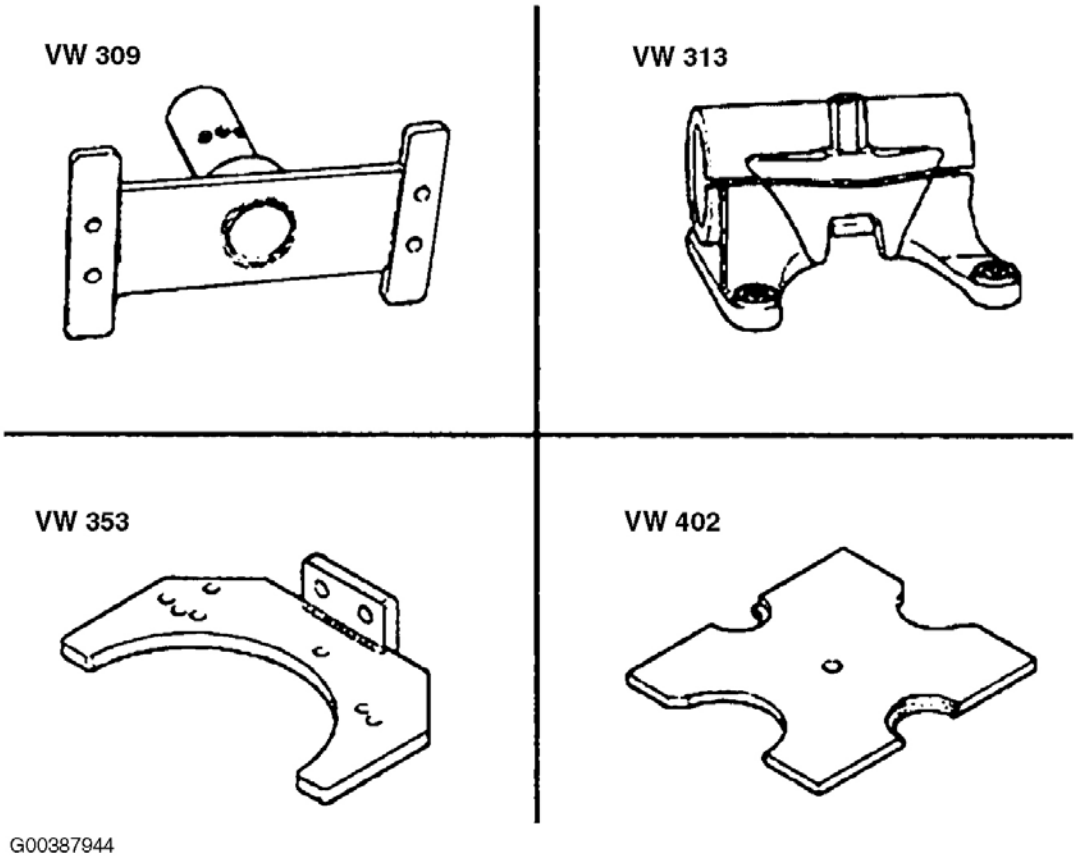
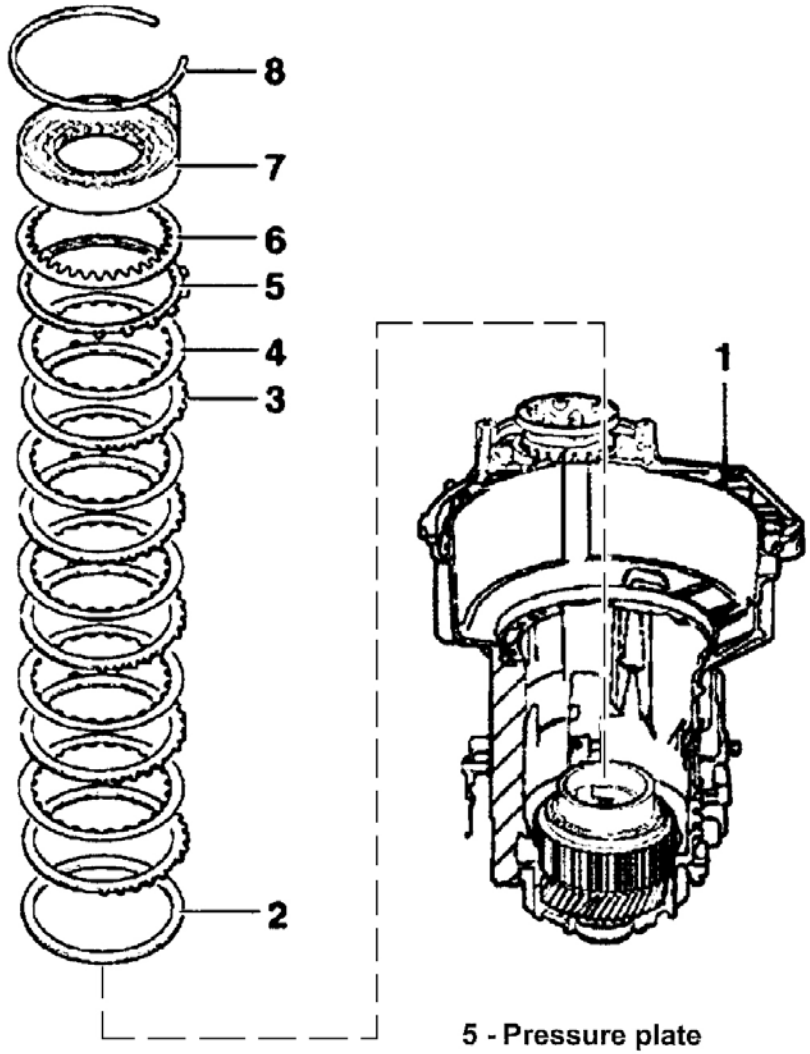


Fig. 93: Pressing On Tapered Roller Bearing Inner Race
Courtesy of VOLKSWAGEN OF AMERICA, INC.

Pressing on sleeve for needle roller bearing



1 - **Transmission housing**
- With input gear and planet carrier installed

2 - **Shim**
3 - **Outer plate -B1-**
4 - **Inner plate -B1-**
5 - **Pressure plate**
- Install with flat side facing plates
- Spare part is assigned according to transmission code letters

6 - **Dished washer**
- Convex side faces freewheel

7 - **Freewheel with -B1- piston**
8 - **Circlip**

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Fig. 94: Pressing On Sleeve For Needle Roller Bearing
Courtesy of VOLKSWAGEN OF AMERICA, INC.

Pressing out tapered roller bearing outer race

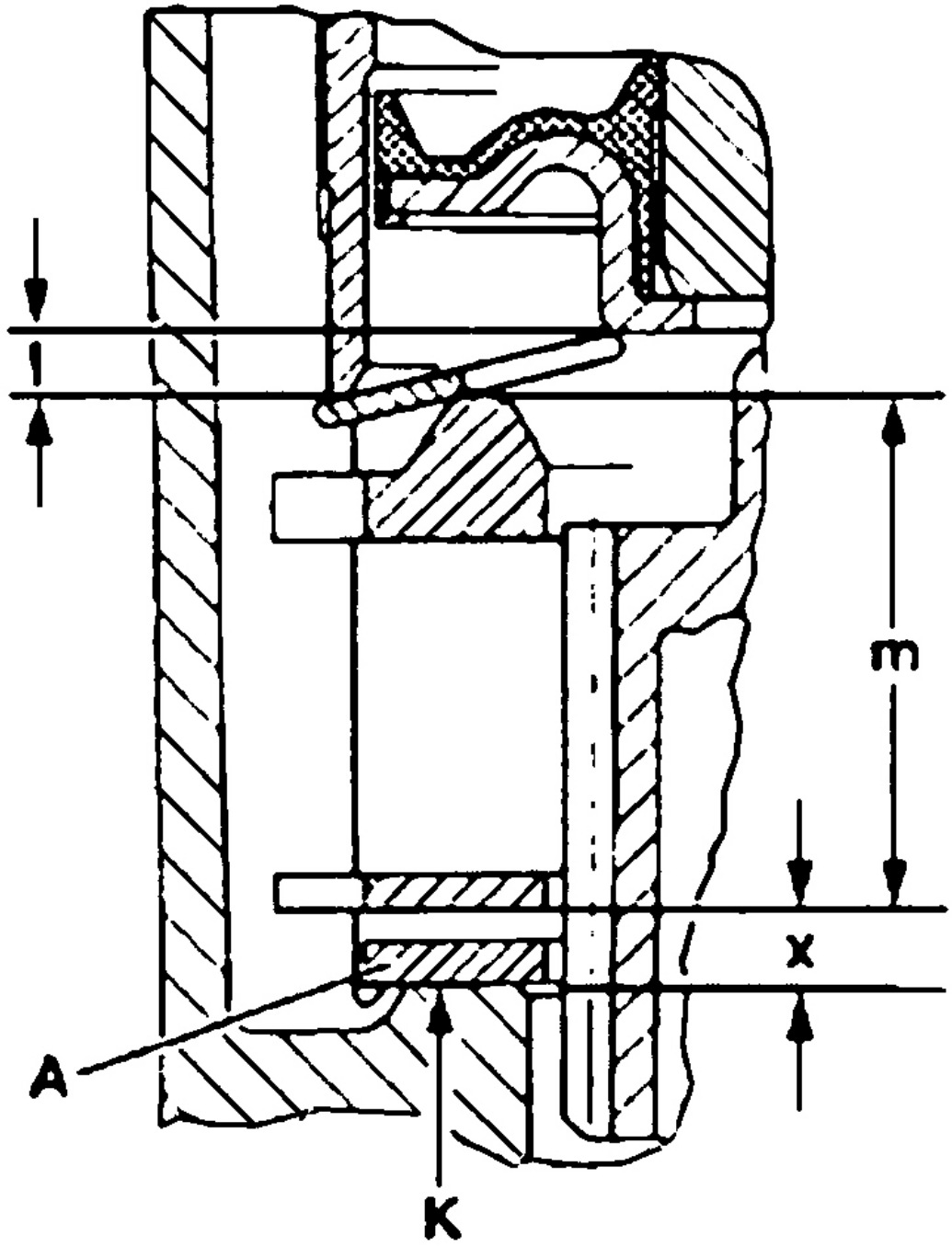


Fig. 95: Pressing Out Tapered Roller Bearing Outer Race
Courtesy of VOLKSWAGEN OF AMERICA, INC.

Pressing in tapered roller bearing outer race

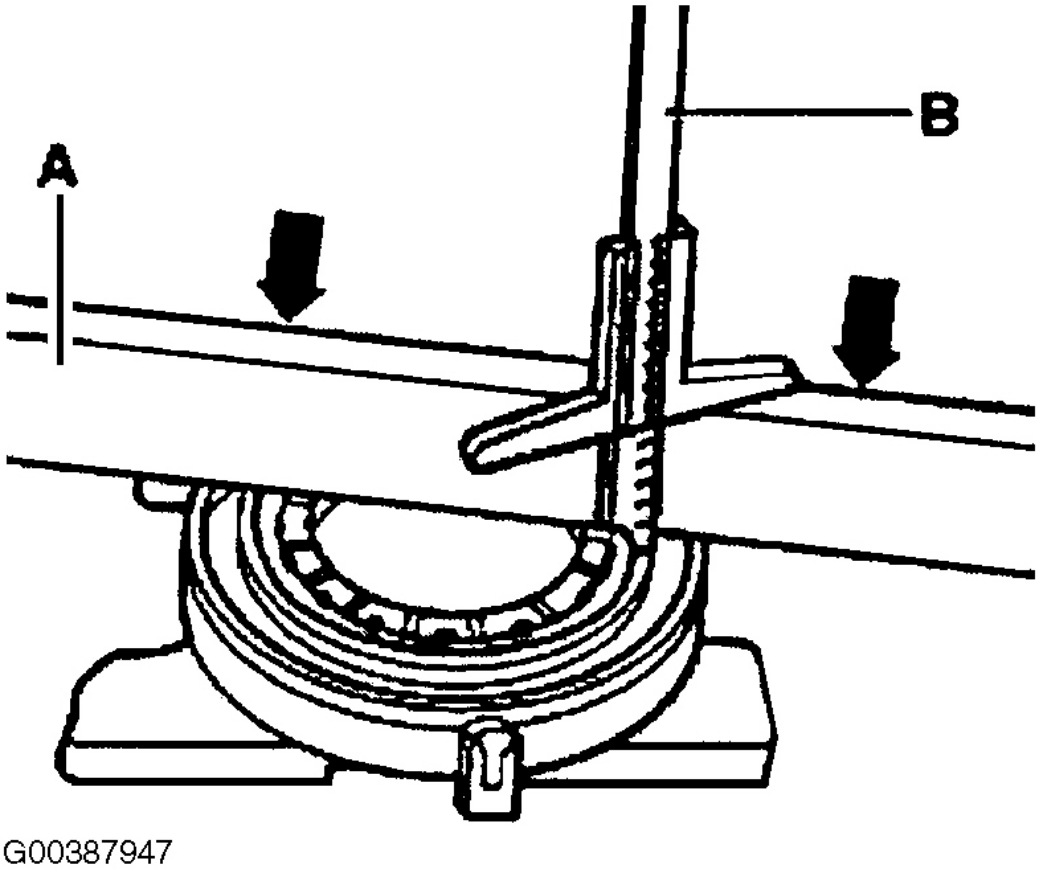


Fig. 96: Pressing In Tapered Roller Bearing Outer Race
Courtesy of VOLKSWAGEN OF AMERICA, INC.

- Install with adjusting shim after adjusting input shaft.

5th gear synchronizer

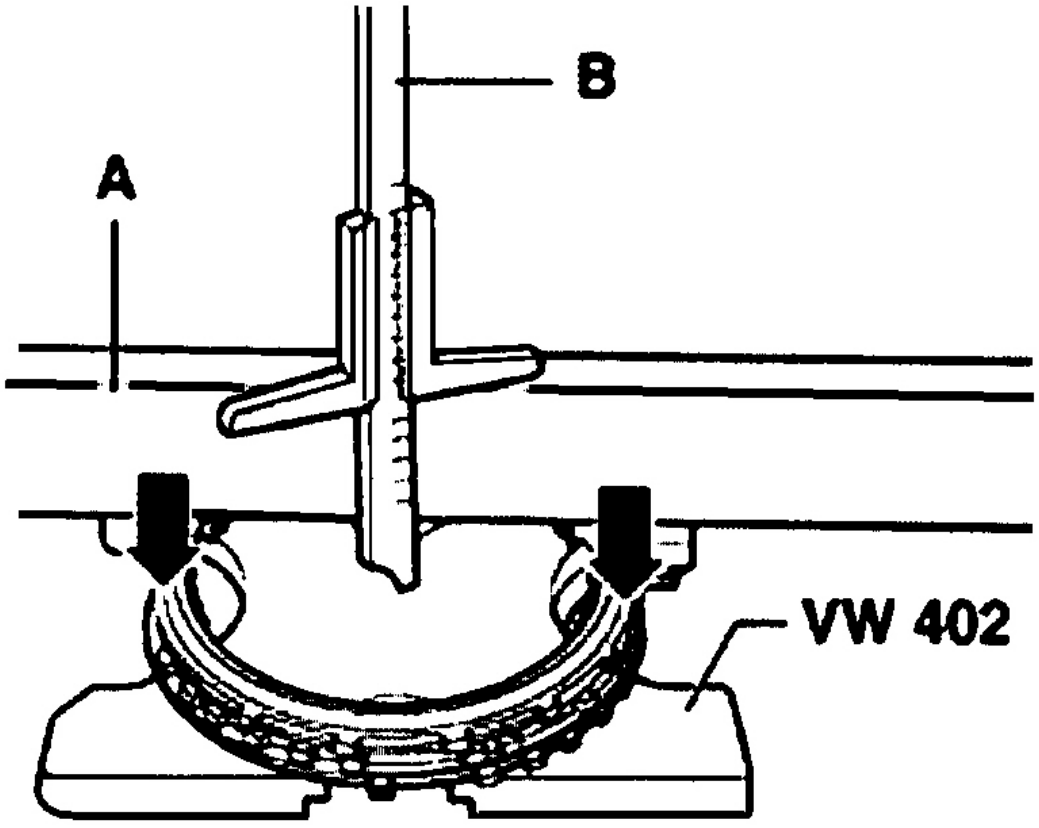


Fig. 97: Identifying 5th Gear Synchronizer
Courtesy of VOLKSWAGEN OF AMERICA, INC.

1. Springs for lock pieces
2. Locking collar

   With 3 recesses (arrows A) for the locking pieces (item 4)

3. Synchro-hub
4. Locking pieces

   Installation position: The thin extension (arrow B) faces the pointed teeth of the locking collar (item -2-)

Assembling 5th gear locking collar/synchro-hub

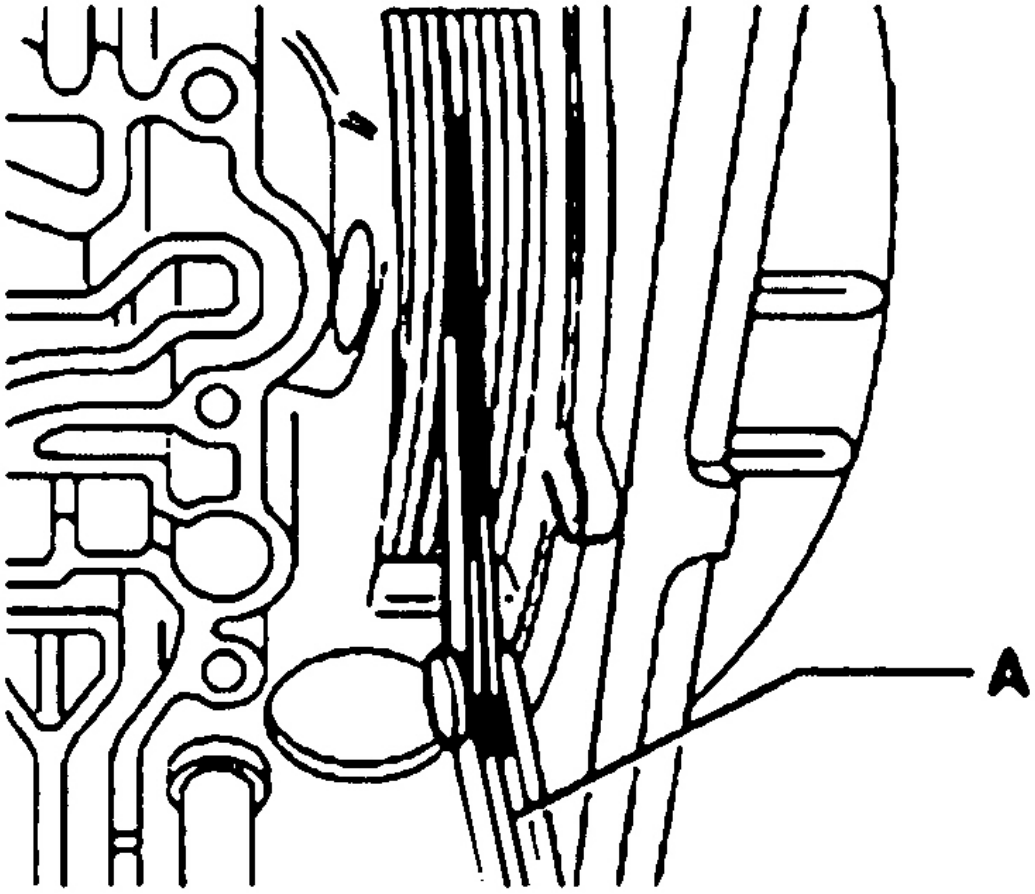


Fig. 98: Assembling 5th Gear Locking Collar/Synchro-Hub
Courtesy of VOLKSWAGEN OF AMERICA, INC.

- Push locking collar over synchro-hub.

  Pointed teeth -A- of the locking collar and shoulder -B- of the syncro-hub face in one direction. The cut outs for the locking piece in the locking collar and the syncro-hub must be in-line with one another (See **5th gear synchronizer** and **Fig. 122**).

- Insert locking pieces (Installation position: see **5th gear synchronizer**).
- Insert springs offset by 120° underneath lug - C-. Angled ends of spring must be directly behind locking pieces (arrows).

Changed springs for 5th gear synchronizer from transmission manufacture date November 11 01

- The ends -A- of the springs are bended from the transmission date indicated above.

  The changed springs are installed on both sides.

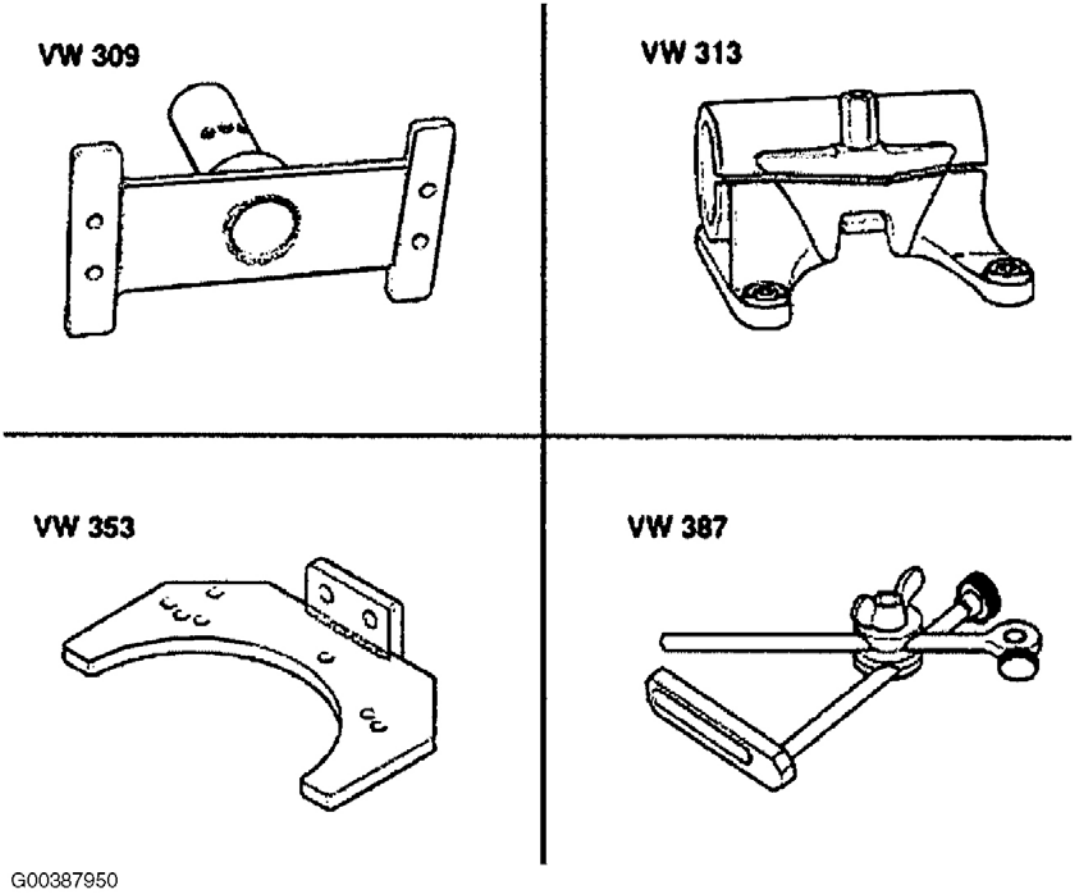
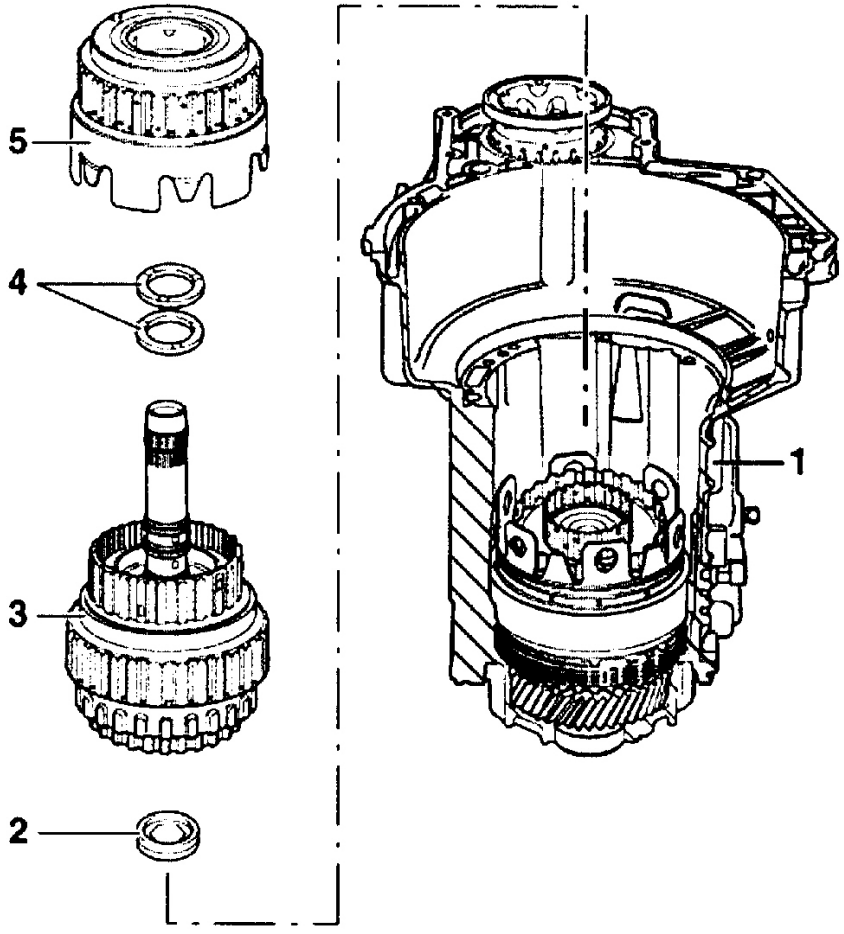


Fig. 99: Installing Changed Springs
Courtesy of VOLKSWAGEN OF AMERICA, INC.

- The changed springs can be installed in previous transmissions only with locking pieces, which are inner hollow.
- Inserting lock pieces (installation position: See **5th gear synchronizer**).
- Installation position of the springs:
- Insert springs offset by 120°.
- The spring must secure with the angled end -A- in the hollow lock piece.



1 - Transmission housing

2 - Axial needle bearing with washer

- Axial needle bearing faces small input shaft
- Washer faces toward-K3-

3 - 1st to 3rd gear clutch -K1- with 3rd and 4th gear clutch -K3-

- The clutches -K1- and -K3- are pressed together

4 - Shims

- Do not install when adjusting clutch play
- 1 or 2 shims can be installed

5 - Reverse gear clutch -K2-

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Fig. 100: Locating Installation Position Of Springs
Courtesy of VOLKSWAGEN OF AMERICA, INC.

The spring must be under the lug -B- from the locking piece.

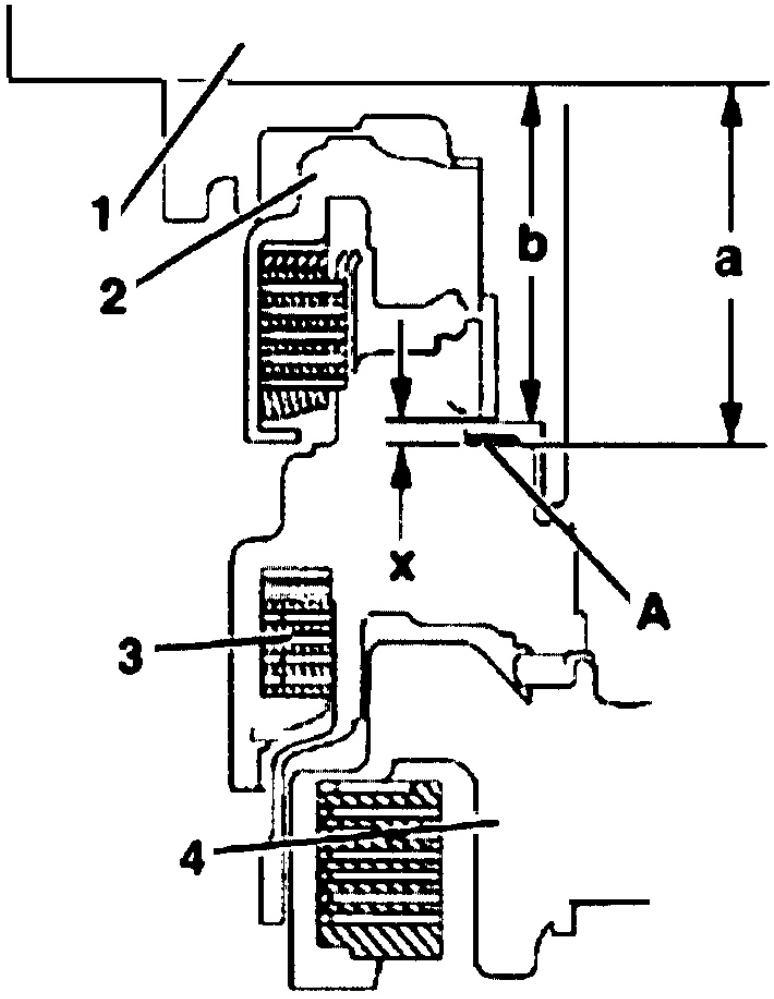
The bended end points always from synchronizer body (direction of arrow).

INPUT SHAFT, ADJUSTING

(Determining input shaft adjustment shim)

Special tools and equipment

- VW 387 Universal dial gauge bracket
- VW 385/17 End measuring plate
- VW510 Press piece
- VW 447 i Thrust plate
- VW 407 Press tool
- V.A.G 1331 Torque wrench
- Measuring dial gauge



A - Shim
1 - ATF pump
2 - Reverse gear clutch -K2-
3 - 1st to 3rd gear clutch -K1-
4 - 4th gear clutch -K3-

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Fig. 101: Identifying Special Tools And Equipment
Courtesy of VOLKSWAGEN OF AMERICA, INC.

It is necessary to readjust the input shaft when the following components are replaced:

- Transmission housing
- Clutch housing
- Input shaft
- 4th gear wheel

  or the

- Tapered roller bearings

Adjustment overview. See **Adjustment overview**

- Press tapered roller bearing outer race without shim into transmission housing onto stop, using VW 510.

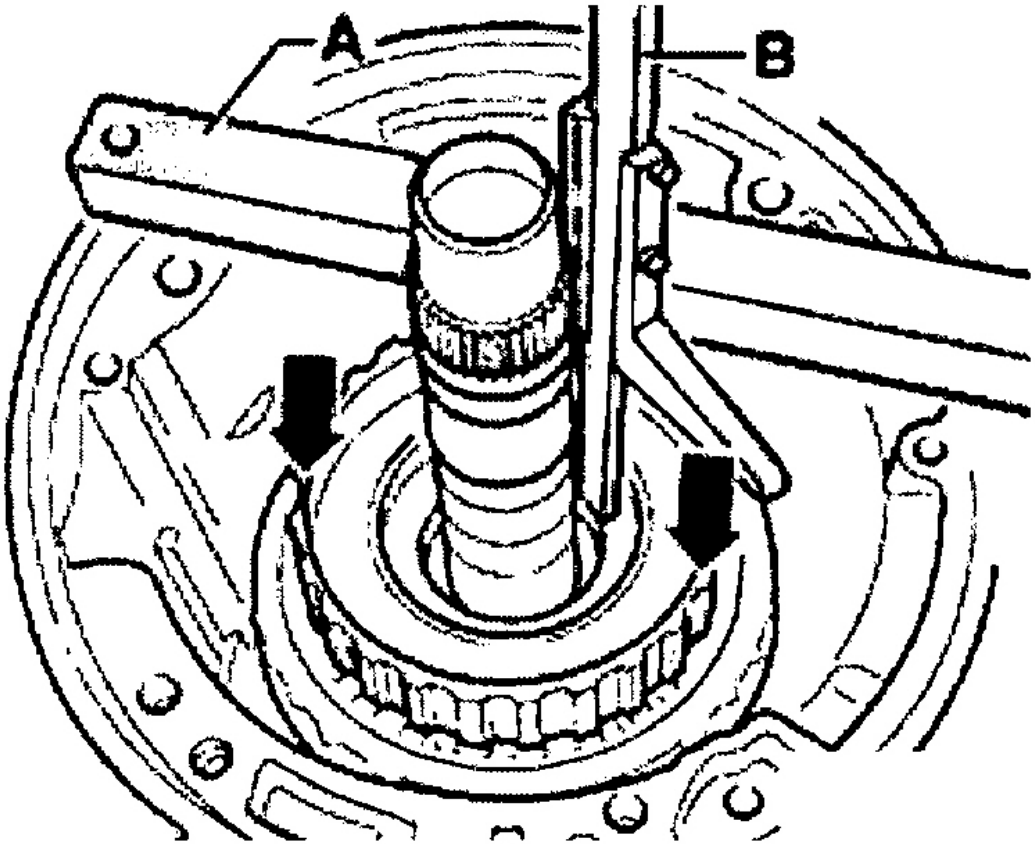

Fig. 102: Installing Tapered Roller Bearing Outer Race

Courtesy of VOLKSWAGEN OF AMERICA, INC.

- Install input shaft in clutch housing and assemble transmission housing. Tighten hex head bolts to 25 N.m and then turn an additional 90°.
- Install dial indicator in clutch housing (large tapered roller bearing in transmission housing).
- Before taking any measurements, rotate input shaft to allow bearings to settle. Set dial gauge to "O" with 1 mm preload.

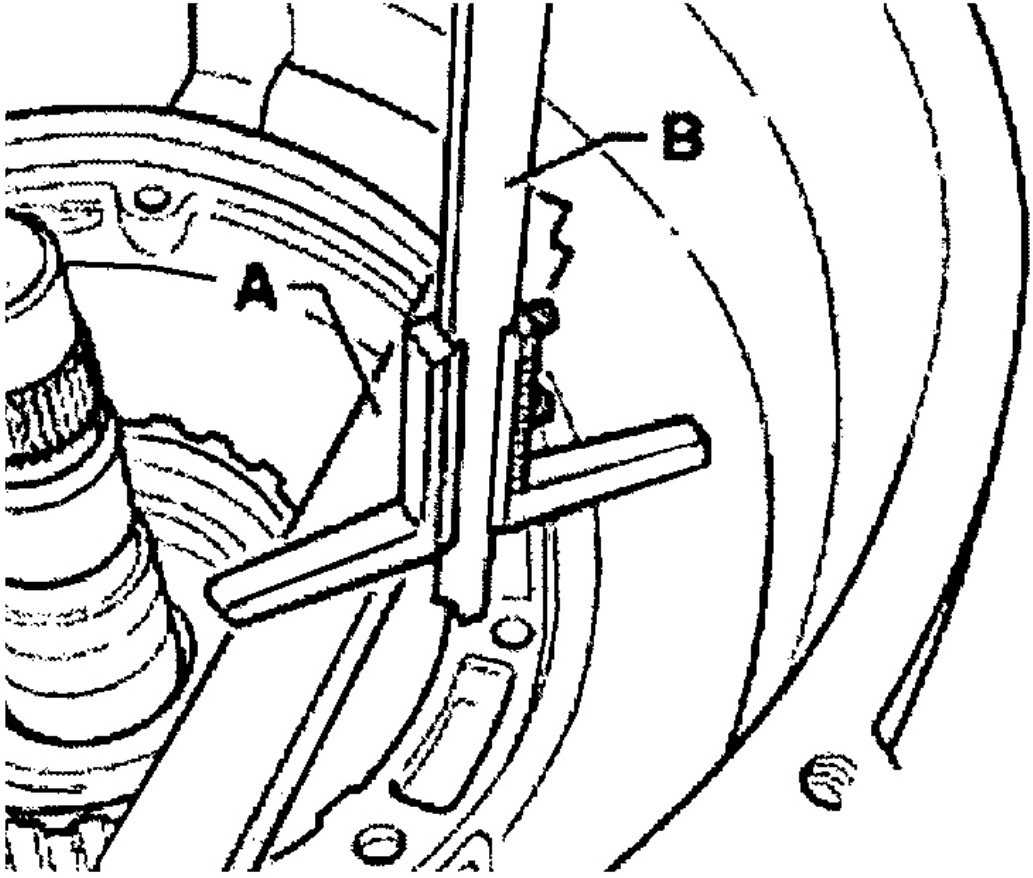

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Fig. 103: Installing Dial Indicator In Clutch Housing
Courtesy of VOLKSWAGEN OF AMERICA, INC.

NOTE: This preparation is to be repeated for each subsequent measurement, otherwise the gauge will not return to the starting position.

- Press input shaft in direction of dial indicator (arrow).
- Read and note clearance indicated on dial indicator (example 1.21).

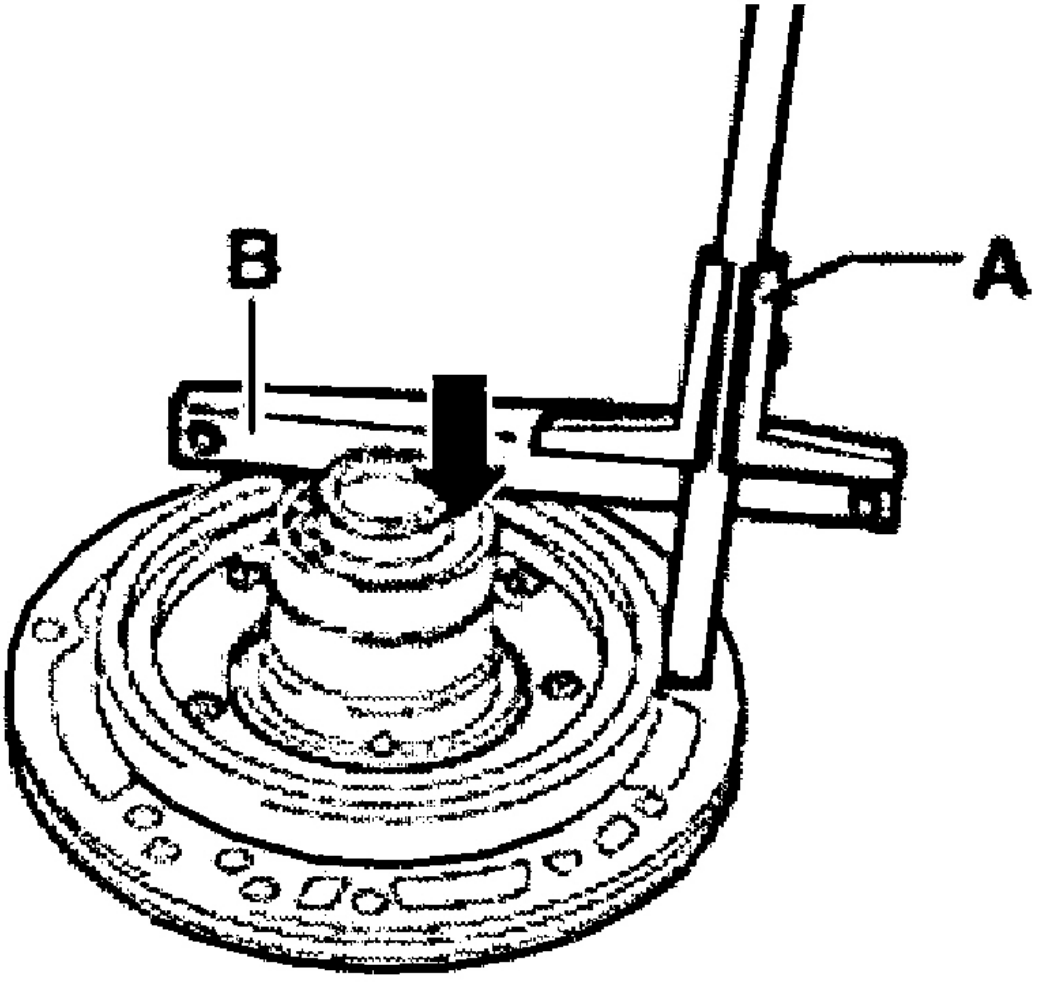


Fig. 104: Measuring Input Shaft Clearance
Courtesy of VOLKSWAGEN OF AMERICA, INC.

NOTE: Dial indicator does not return to original position.

- Determine thickness of shim from table. See **TABLE OF ADJUSTMENT SHIMS** .
- Remove input shaft and press tapered roller bearing outer race out of transmission housing using VW 447i.

- Press tapered roller bearing outer race together with 1.175 shim into transmission housing using VW 510.
- Assemble transmission housing and tighten hex head bolts to 25 N.m and then turn an additional 90°.

Table of adjustment shims

ADJUSTMENT SHIMS (INPUT SHAFT)

Measured	Shim	
bearing clearance (mm)	Thickness (mm)	Part No.
0.671 ... 0.699	0.650	02A 311 140
0.700 ... 0.724	0.675	02A 311 140 A
0.725 ... 0.749	0.700	02A 311 140 B
0.750 ... 0.774	0.725	02A 311 140 C
0.775 ... 0.799	0.750	02A 311 140 D
0.800 ... 0.824	0.775	02A 311 140 E
0.825 ... 0.849	0.800	02A 311 140 F
0.850 ... 0.874	0.825	02A 311 140 G
0.875 ... 0.899	0.850	02A 311 140 H
0.900 ... 0.924	0.875	02A 311 140 J
0.925 ... 0.949	0.900	02A 311 140 K
0.950 ... 0.974	0.925	02A 311 140 L
0.975 ... 0.999	0.950	02A 311 140 M
1.000 ... 1.024	0.975	02A 311 140 N
1.025 ... 1.049	1.000	02A 311 140 P
1.050 ... 1.074	1.025	02A 311 140 Q
1.075 ... 1.099	1.050	02A 311 140 R
1.100 ... 1.124	1.075	02A 311 140 S
1.125 ... 1.149	1.100	02A 311 140 T
1.150 ... 1.174	1.125	02A 311 140 AA
1.175 ... 1.199	1.150	02A 311 140 AB
1.200 ... 1.224	1.175	02A 311 140 AC
1.225 ... 1.249	1.200	02A 311 140 AD
1.250 ... 1.274	1.225	02A 311 140 AE
1.275 ... 1.229	1.250	02A 311 140 AF
1.300 ... 1.324	1.275	02A 311 140 AG
1.325 ... 1.349	1.300	02A 311 140
1.350 ... 1.374	1.325	02A 311 140
1.375 ... 1.399	1.350	02A 311 140 A 02A 311 140 A
1.400 ... 1.424	1.375	02A 311 140 A 02A 311 140 B
1.425 ... 1.449	1.400	02A 311 140 B

		02A 311 140 B
1.450 ... 1.474	1.425	02A 311 140 B 02A 311 140 C
1.475 ... 1.499	1.450	02A 311 140 C 02A 311 140 C
1.500 ... 1.524	1.475	02A311 140 C 02A311 140 D
1.525 ... 1.549	1.500	02A 311 140 D 02A 311 140 D
1.550 ... 1.574	1.525	02A 311 140 D 02A 311 140 E
1.575 ... 1.599	1.550	02A 311 140 E 02A 311 140 E
1.600 ... 1.624	1.575	02A 311 140 E 02A 311 140 F
1.625 ... 1.649	1.600	02A 311 140 F 02A 311 140 F
1.650 ... 1.674	1.625	02A 311 140 F 02A 311 140 G
1.675 ... 1.699	1.650	02A 311 140 G 02A 311 140 G
1.700 ... 1.724	1.675	02A 311 140 G 02A 311 140 H
1.725 ... 1.749	1.700	02A 311 140 H 02A 311 140 H
1.750 ... 1.774	1.725	02A 311 140 H 02A 311 140 J
1.775 ... 1.791	1.750	02A 311 140 J 02A 311 140 J

Measurement, checking

- Install measuring appliance and dial gauge

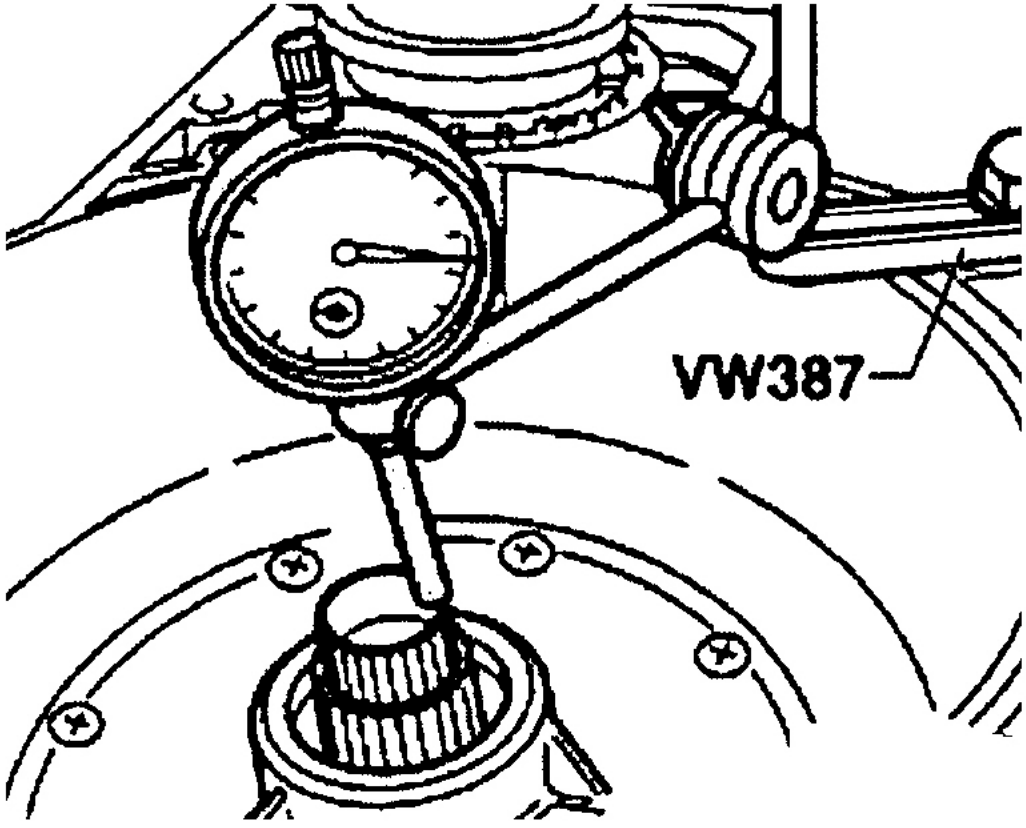


Fig. 105: Installing Measuring Appliance And Dial Gauge
Courtesy of VOLKSWAGEN OF AMERICA, INC.

- Rotate input shaft so that tapered roller bearings settle.
- Press input shaft in direction of arrow.

Bearing play should be min. 0.01 ... max. 0.09 mm.

NOTE: If the bearing clearance cannot be measured, but input shaft play is perceptible and the input shaft turns freely, the adjustment is acceptable.

OUTPUT SHAFT, DISASSEMBLING AND ASSEMBLING

Special tools and equipment

- VW 407 Press tool
- VW412 Press tool
- VW512 Press disk
- V.A.G 1582 Puller
- V.A.G 1582/4 Grip piece
- V.A.G 1582/5 Grip piece

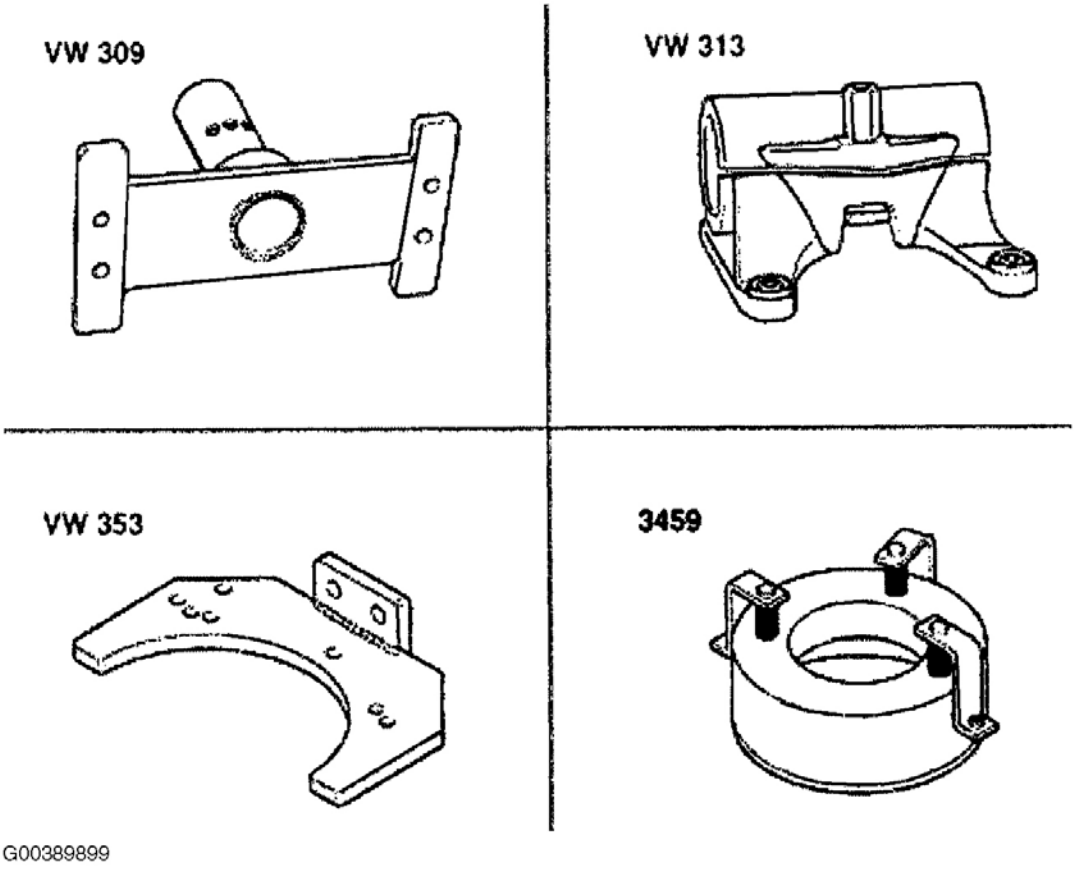
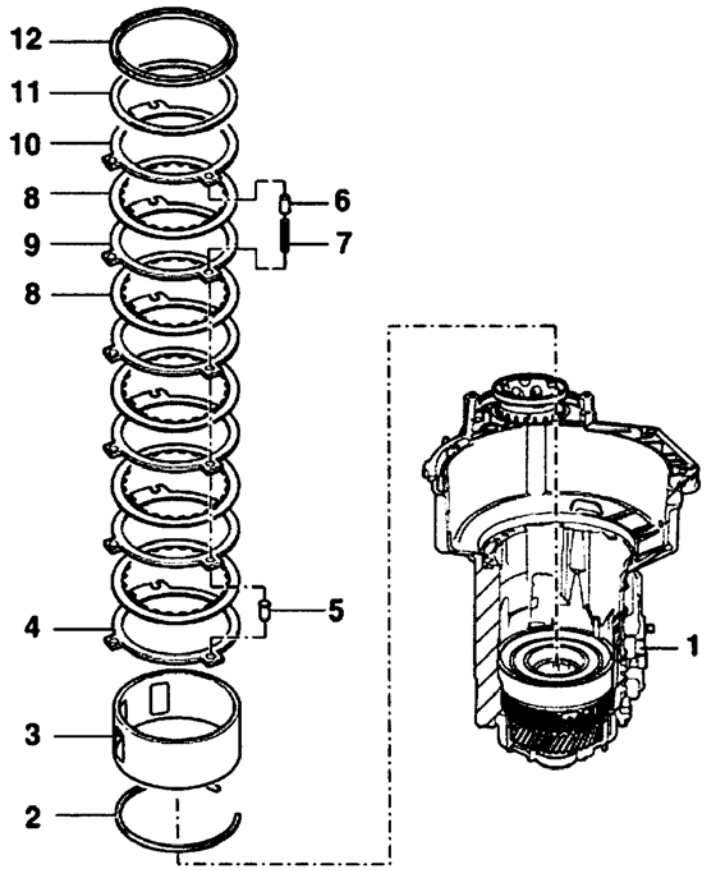


Fig. 106: Identifying Special Tools And Equipment (1 Of 3)
Courtesy of VOLKSWAGEN OF AMERICA, INC.

- VW 402 Press plate
- 32-111 Thrust piece
- VW 408 A Press tool
- VW 409 Press tool
- VW 457 Support rails
- VW 519 Tube



1 - Transmission housing

2 - Circlip
- For supporting tube

3 - Supporting tube -B2-
- Replacement part is assigned according to transmission code letters
- Insert so that notch locates on freewheel wedge

4 - Outer plate -B2-
- 3 mm thick

5 - Spring cap
- Install after installing first outer plate (item - 4 -)

6 - Spring cap
- Do not install when adjusting -B2-
- Install before installing last outer plate

7 - Spring
- Replacement part is assigned according to transmission code letters

8 - Inner plate -B2-
- Replacement part is assigned according to transmission code letters

9 - Outer plate -B2-
- Always install 2 mm thick outer plates

10 - Outer plate -B2-
- 3 mm thick
- Do not install when adjusting -B2-

11 - Shim
- Do not install when adjusting -B2-

12 - Retaining ring
- Inserted with smooth side facing last inner plate (item - 8 -) when adjusting - B2-.

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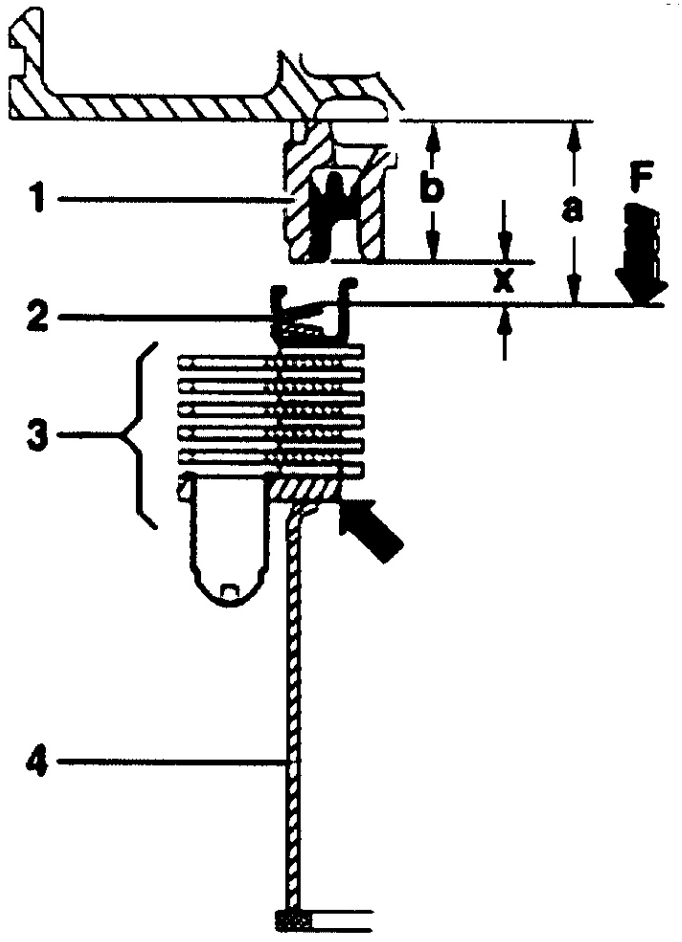
Fig. 107: Identifying Special Tools And Equipment (2 Of 3)
Courtesy of VOLKSWAGEN OF AMERICA, INC.

- VW 429 Thrust ring

- VW 415 A Tube
- VW 447 H Press plate
- VW 454 Press piece
- VW 455 Fitting sleeve
- 41-501 Drift sleeve



1 - ATF pump

2 - Retaining ring

3 - Plates for -B2- without last outer plate

4 - Supporting tube

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Fig. 108: Identifying Special Tools And Equipment (3 Of 3)
Courtesy of VOLKSWAGEN OF AMERICA, INC.

- 1 - Kukko 21/6 Internal extractor

- 4 - Kukko 22/2 Retainer

NOTE:

- **The output shaft is disassembled as follows:**
  - **Position separating device under 2nd gear wheel (item 19) and press off as described in Pressing off 3rd and 4th gear synchro-hub/locking collar, 2nd, 3rd and 4th gear wheels with transmission housing needle roller bearing sleeve .**
  - **Remove circlip (item 15).**
  - **Position two-arm puller under bearing support (item 9) and pull off locking collar with 1st and 2nd gear synchro-hub as described in. See Pulling off locking collar with synchro-hub and bearing support .**
- **When installing new gear wheels or a new output shaft consult technical data. See Code letters, transmission application, ratios, capacities .**
- **Both tapered roller bearings must be replaced as a set.**

NOTE: The following list refers to items in Fig. 109 .

1. **Hex nut, 25 N.m plus an additional 1/4 turn 90°**
   - 4 nuts for bearing support
2. **Clutch housing**
3. **Shim**
   - For output shaft
   - Adjustment overview. See **Adjustment overview**
4. **Small tapered roller bearing outer race**
   - Removing. See **Output shaft, disassembling and assembling**
   - Pressing in. See **Pressing in small tapered roller bearing outer race**
5. **Small tapered roller bearing inner race**
   - Pulling off. See **Pulling off small tapered roller bearing inner race**
   - Pressing on **Pressing on small tapered roller bearing inner race**
6. **Output shaft**
   - Is paired with final drive gear wheel, always replace together as a set
   - Adjusting. See **OUTPUT SHAFT, ADJUSTING**
7. **Large tapered roller bearing inner race**
   - Pulling off. See **Pulling off large tapered roller bearing inner race**
   - Pressing on **Pressing on large tapered roller bearing inner race**
8. **Sealing ring**
   - Place sealing rings (Qty. 4) on bearing support bolts
9. **Bearing support**
   - With large tapered roller bearing outer race and bolts

- Only change outer race with large tapered roller bearing and bearing support

10. **Thrust washer**
    - Shoulder on thrust washer faces tapered roller bearing
11. **1st gear wheel**
    - From transmission manufacture date May 02 00 the synchronizer for 1st gear was changed. See **CHANGED SPRINGS FOR 5TH GEAR SYNCHRONIZER FROM TRANSMISSION MANUFACTURE DATE NOVEMBER 11 01**
12. **Needle roller bearing**
    - For 1st gear
13. **1st gear synchro-ring**
    - Checking for wear. See **Checking synchro-ring for wear**
    - Identification **Identifying 1st and 2nd gear synchro-rings**
    - From transmission manufacture date May 02 00 the synchronizer for 1st gear was changed. See **CHANGED SPRINGS FOR 5TH GEAR SYNCHRONIZER FROM TRANSMISSION MANUFACTURE DATE NOVEMBER 11 01**
14. **1st and 2nd gear locking collar with synchro-hub**
    - Pull off with bearing support after removing circlip (item 15). See **Pulling off locking collar with synchro-hub and bearing support**
    - Disassembling **Disassembling and assembling 1st and 2nd gear locking collar and synchro-hub**
    - Assembling locking collar/synchro hub. See **Disassembling and assembling 1st and 2nd gear locking collar and synchro-hub** and **Assembling 1st and 2nd gear locking collar/synchro-hub**
    - Installation position. See **Installation position 1st and 2nd gear locking collar/synchro-hub**
    - Pressing on **Pressing on 1st and 2nd gear locking collar/synchro-hub**
    - From transmission manufacture date May 02 00 the synchronizer for 1st gear was changed. See **CHANGED SPRINGS FOR 5TH GEAR SYNCHRONIZER FROM TRANSMISSION MANUFACTURE DATE NOVEMBER 11 01**
15. **Securing clip**
16. **2nd gear synchro-ring**
    - Identification **Identifying 1st and 2nd gear synchro-rings**
    - Checking for wear. See **Checking 2nd gear synchro-ring for wear**
    - Assemble so that recesses locate in locking collar (item 14) locking pieces
    - From transmission manufacture date May 02 00 the synchronizer for 1st gear was changed. See **CHANGED SPRINGS FOR 5TH GEAR SYNCHRONIZER FROM TRANSMISSION MANUFACTURE DATE NOVEMBER 11 01**
17. **Outer ring**
    - Insert in synchro-ring (item 16). Installation position. See **Installation position outer-ring**
    - Replace if scored or worn
18. **Synchro-ring**
    - (Inner ring)

- Checking for wear. See **Installation position 1st and 2nd gear locking collar/synchro-hub** .
- Check lugs for scoring
- Installation position. See **Installation position synchro-ring (inner-ring)**

19. **2nd gear wheel**
    - Installation position. See **Installation position 2nd gear wheel**
20. **Needle roller bearing**
    - For 2nd gear
21. **Thrust washer**
22. **Sleeve for 3rd gear needle roller bearing**
    - Pressing off with 2nd gear wheel. See **Pressing off 3rd and 4th gear synchro-hub/locking collar, 2nd, 3rd and 4th gear wheels with transmission housing needle roller bearing sleeve**
    - Pressing on **Pressing on needle roller bearing sleeve for 3rd gear**
23. **Needle roller bearing**
    - For 3rd gear
24. **3rd gear wheel**
25. **3rd gear synchro-ring**
    - Checking for wear. See **Checking synchro-ring for wear**
26. **Locking collar with 3rd and 4th gear synchro-hub**
    - Press off with 2nd gear wheel (item 19) and 3rd gear wheel (item 24). See **Pressing off 3rd and 4th gear synchro-hub/locking collar, 2nd, 3rd and 4th gear wheels with transmission housing needle roller bearing sleeve**
    - Disassembling. See **Disassembling and assembling 3rd and 4th gear locking collar and synchro-hub**
    - Installation position locking collar/synchro-hub. See **Installation position 3rd and 4th gear locking collar/synchro-hub**
    - Assembling locking collar/synchro-hub. See **Disassembling and assembling 3rd and 4th gear locking collar and synchro-hub** and **Assembling 3rd and 4th gear locking collar/synchro-hub**
    - Pressing on **Pressing on 3rd and 4th gear synchro-hub with locking collar**
27. **Sleeve**
    - For needle roller bearing
    - Press off with locking collar and 3rd and 4th gear synchro-hub (item 26). See **Pressing off 3rd and 4th gear synchro-hub/locking collar, 2nd, 3rd and 4th gear wheels with transmission housing needle roller bearing sleeve**
    - Pressing on **Pressing on sleeve for 4th gear needle roller bearing**
28. **Needle roller bearing**
    - For 4th gear
29. **4th gear synchro-ring**
    - Checking for wear. See **Checking synchro-ring for wear**
30. **4th gear wheel**

31. **Thrust washer**
32. **Needle roller bearing**
    - For output shaft
    - Removing and installing. See **Driving out needle roller bearing**
33. **Transmission housing**
34. **Sleeve**
    - For output shaft needle roller bearing
    - Pressing off. See **Pressing off 3rd and 4th gear synchro-hub/locking collar, 2nd, 3rd and 4th gear wheels with transmission housing needle roller bearing sleeve**
    - Pressing on **Pressing on sleeve for output shaft needle roller bearing**
35. **5th gear wheel**
    - Removing and installing. See **Assembly sequence**
36. **Saucer spring washer**
    - Installation position. See **Installation position of dished spring for gear wheel and 5th gear synchro-hub securing bolts:**
37. **Torx socket head bolt M10, 80 N.m**
    - Installed portion on bolt head holds saucer spring washer in position

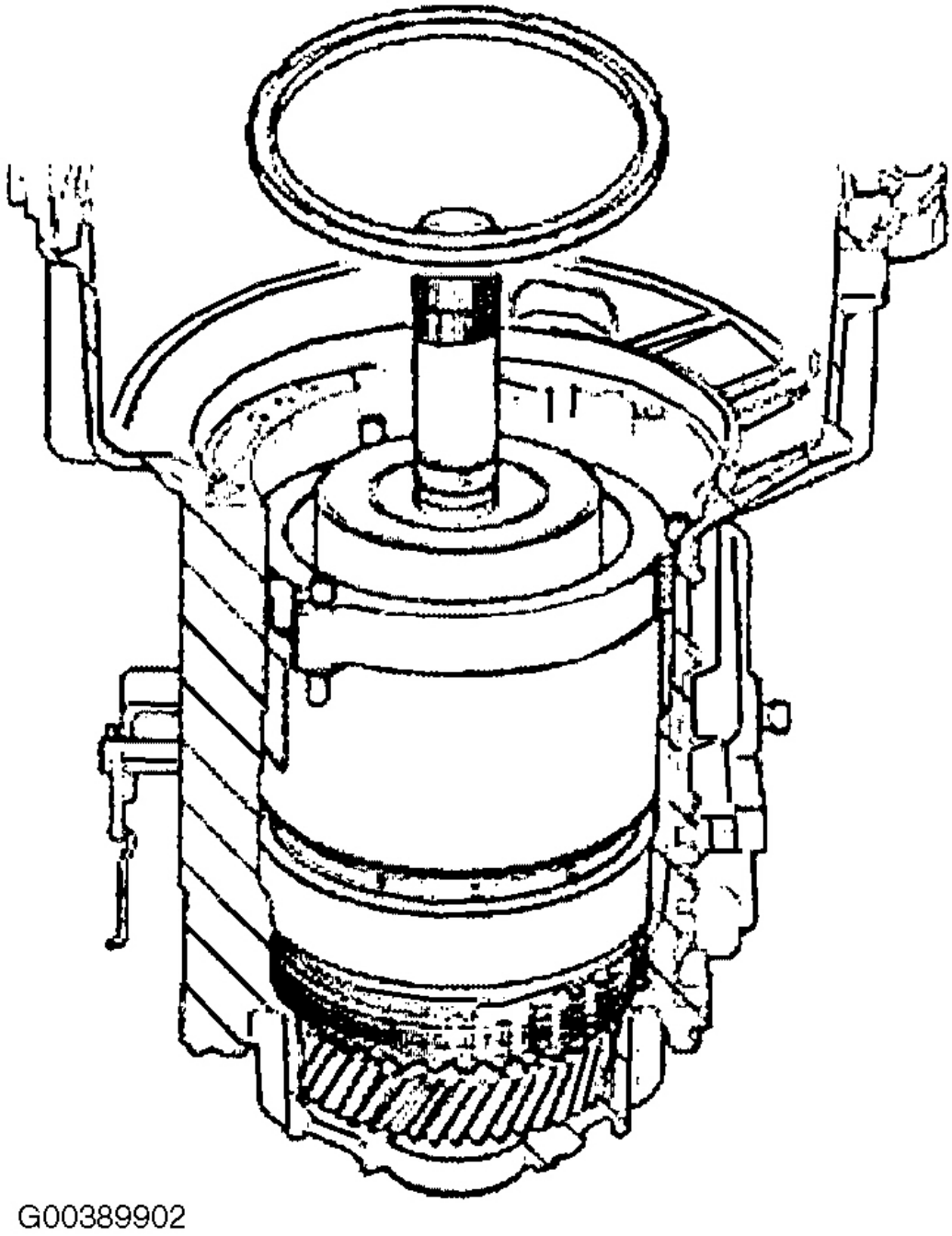

Fig. 109: Disassembled View Of Output Shaft
Courtesy of VOLKSWAGEN OF AMERICA, INC.

Pulling out small tapered roller bearing outer race

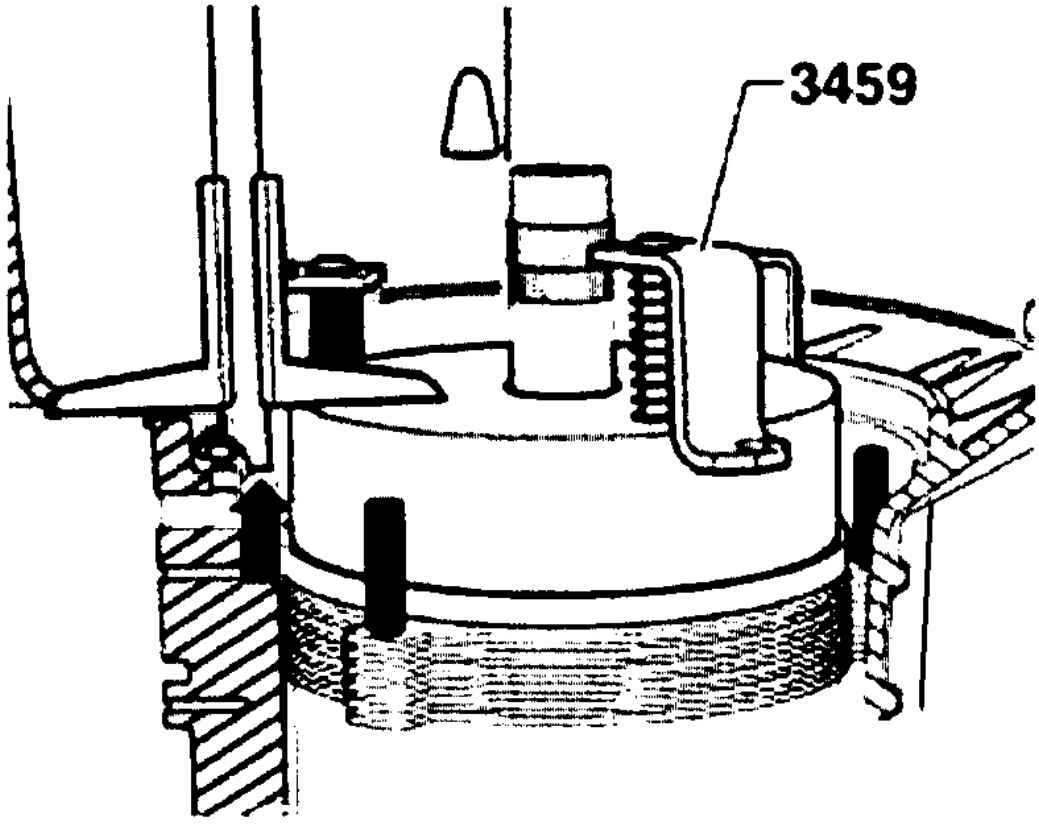

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Fig. 110: Pulling Out Small Tapered Roller Bearing Outer Race
Courtesy of VOLKSWAGEN OF AMERICA, INC.

A. Internal extractor 37 ... 46 mm, e.g. Kukko 21/6
B. Counter support, e.g. Kukko 22/2

Pressing in small tapered roller bearing outer race

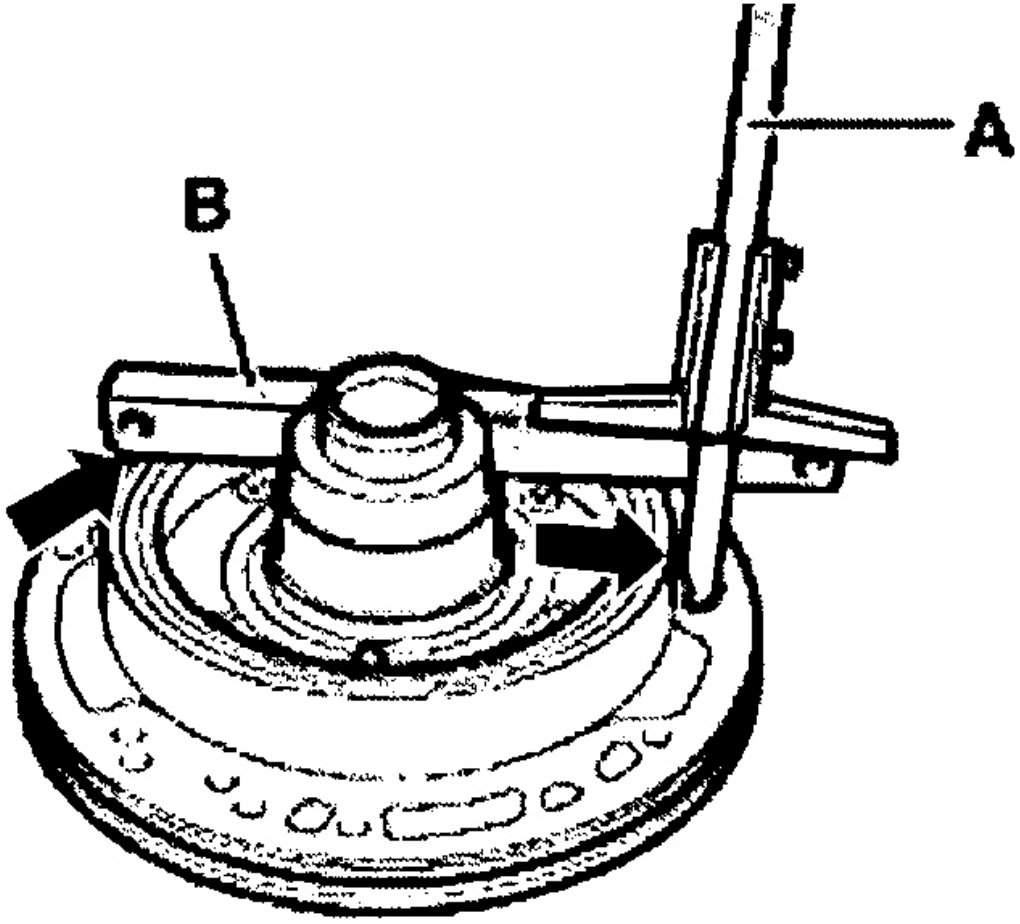


Fig. 111: Pressing In Small Tapered Roller Bearing Outer Race
Courtesy of VOLKSWAGEN OF AMERICA, INC.

Pulling off small tapered roller bearing inner race

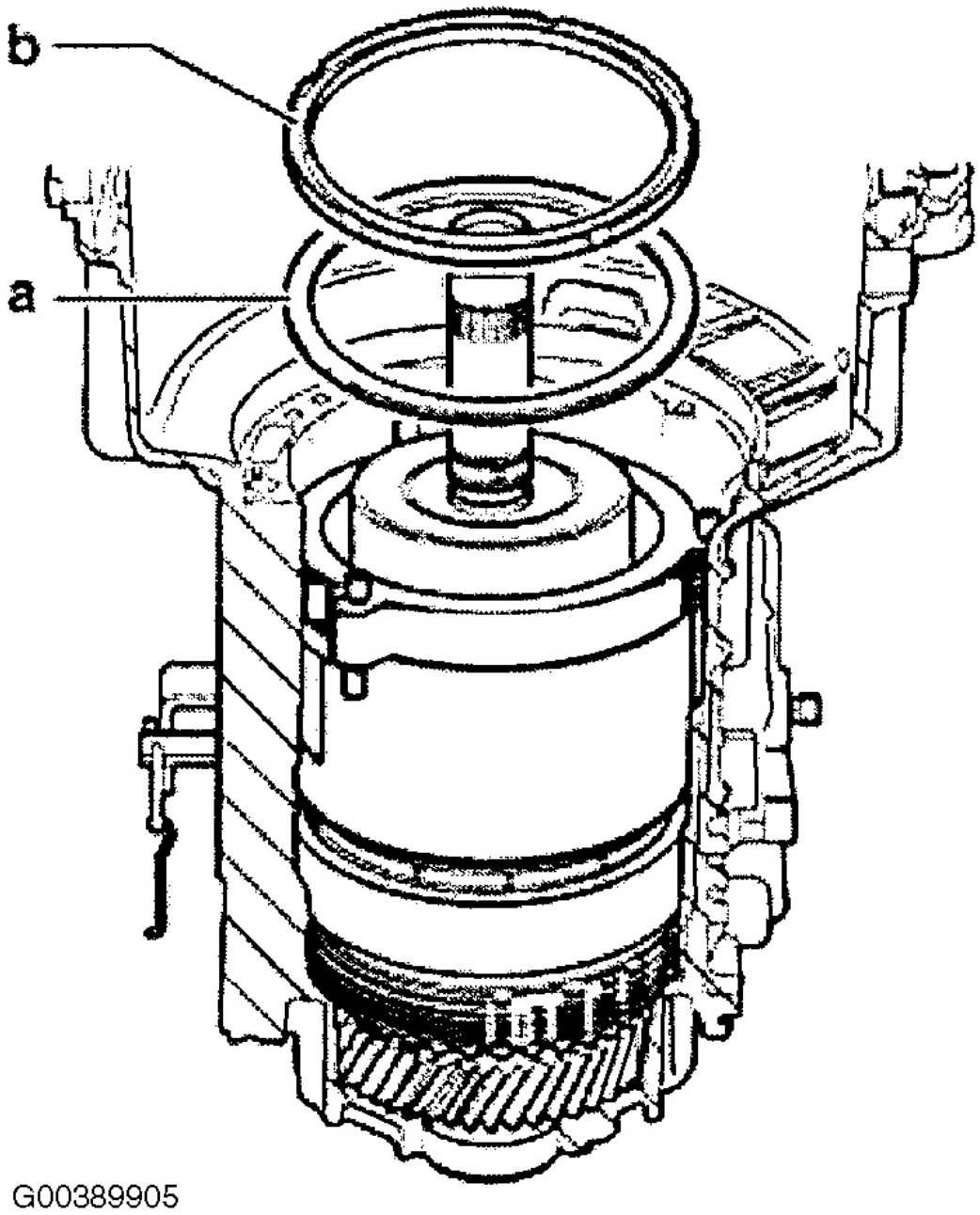
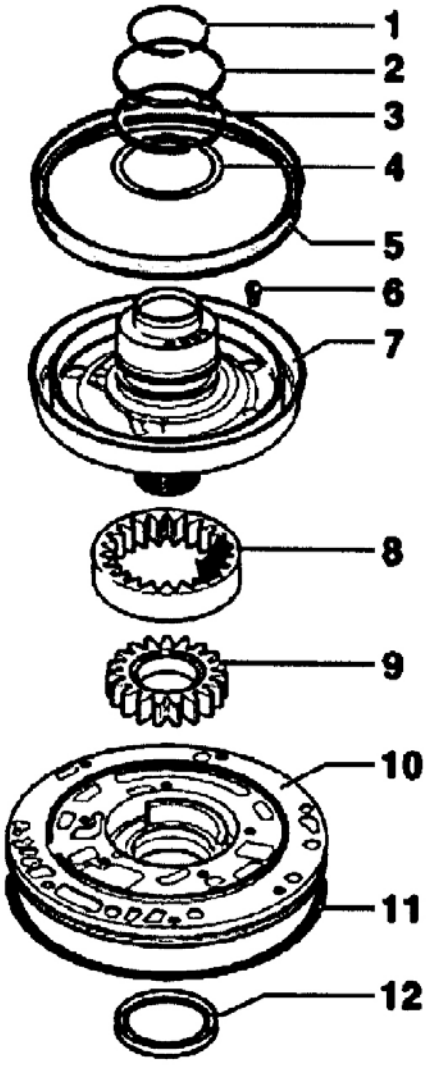


Fig. 112: Pulling Off Small Tapered Roller Bearing Inner Race
Courtesy of VOLKSWAGEN OF AMERICA, INC.

A. Vice clamps/vice
    - Install gripping device and tension behind bearing rollers, then turn bearing and retension gripping

device.

Pressing on small tapered roller bearing inner race



1 - **Piston ring**
2 - **Piston ring**
3 - **Piston ring**
4 - **Thrust washer**
5 - **Piston**
- Sealing lips are vulcanized to the piston
- Moisten sealing lips with ATF before inserting
- Turn piston slightly when installing

6 - **Bolt, 10 Nm**
- Then turn 45° further

7 - **Stator support**
8 - **Outer gear**
- Manufacturer's marking (arrow) faces stator support
- If outer gear is incorrectly installed, ATF pump may not operate freely in installed position

9 - **Inner gear**
- Larger groove faces stator support

10 - **Housing for ATF pump**
11 - **O-ring**
- Always replace

12 - **Torque converter oil seal**

Fig. 113: Pressing On Small Tapered Roller Bearing Inner Race
Courtesy of VOLKSWAGEN OF AMERICA, INC.

Pressing off 3rd and 4th gear synchro-hub/locking collar, 2nd, 3rd and 4th gear wheels with transmission housing needle roller bearing sleeve

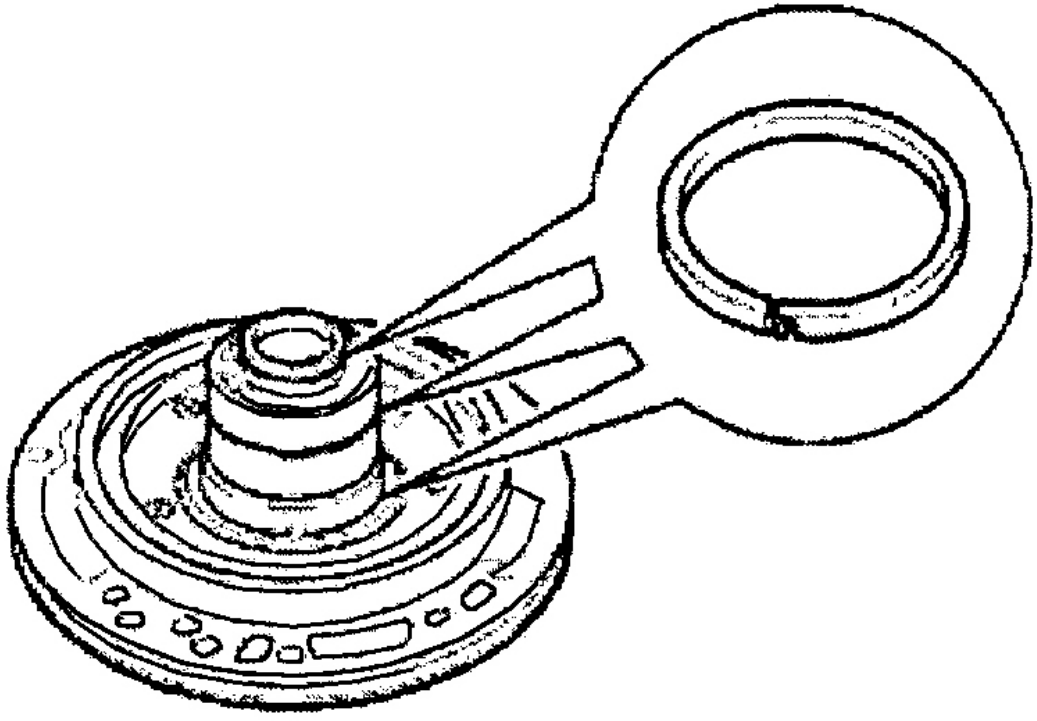


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Fig. 114: Pressing off 3rd and 4th gear synchro-hub/locking collar, 2nd, 3rd and 4th gear wheels with transmission housing needle roller bearing sleeve
Courtesy of VOLKSWAGEN OF AMERICA, INC.

A. Separating device 22 ... 115 mm, e.g. Kukko 17/2
B. Hex bolt 17 mm AF - M10 x 20

NOTE: Support separating appliance so that the 1st and 2nd gear locking collar is not pulled off at the same time.

Pulling off locking collar with synchro-hub and bearing support

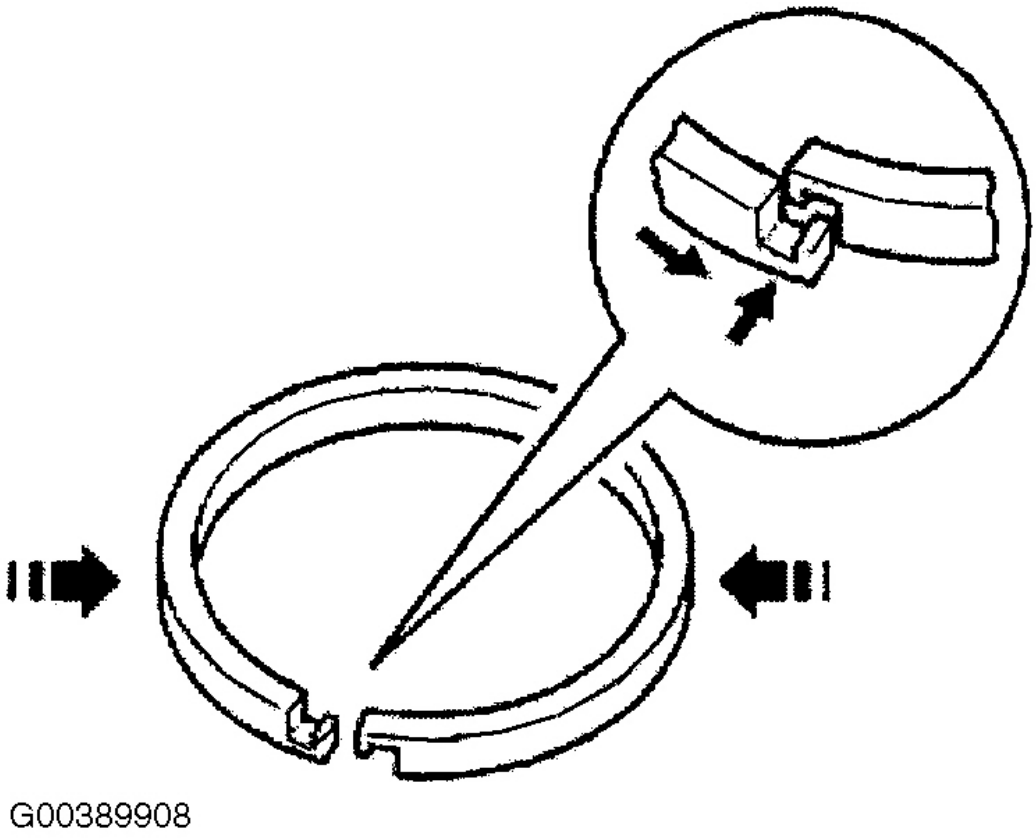
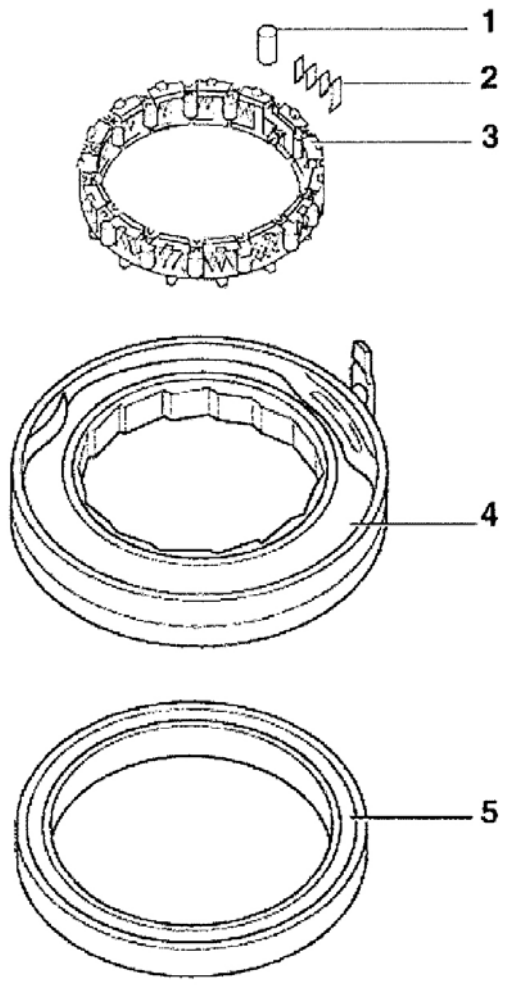


Fig. 115: Pulling Off Locking Collar With Synchro-Hub And Bearing Support
Courtesy of VOLKSWAGEN OF AMERICA, INC.

- First remove the circlip -arrow-.

Pulling off large tapered roller bearing inner race



1 - Rollers

2 - Springs

3 - Cage

4 - Outer ring

5 - Piston

- Sealing lips are vulcanized to the piston
- Moisten sealing lips with ATF before installing
- Turn piston slightly when installing

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Fig. 116: Pulling Off Large Tapered Roller Bearing Inner Race
Courtesy of VOLKSWAGEN OF AMERICA, INC.

A. Vice clamps

- Before installing puller insert a M 10 x 20 hex bolt in output shaft drilling.

Pressing on large tapered roller bearing inner race

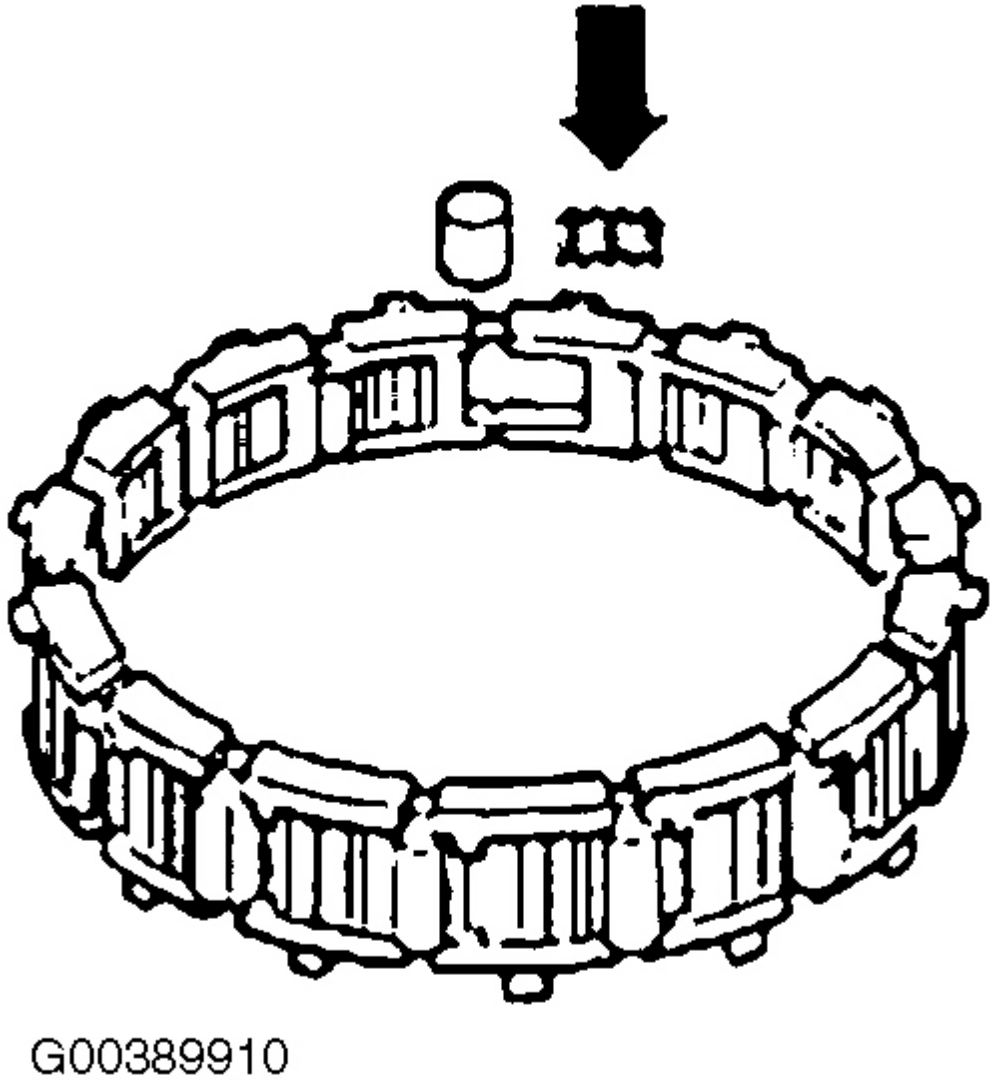

Fig. 117: Pressing On Large Tapered Roller Bearing Inner Race
Courtesy of VOLKSWAGEN OF AMERICA, INC.

A. Thrust washer

- Install thrust washer before pressing on inner race. Shoulder faces inner race.

Checking synchro-ring for wear

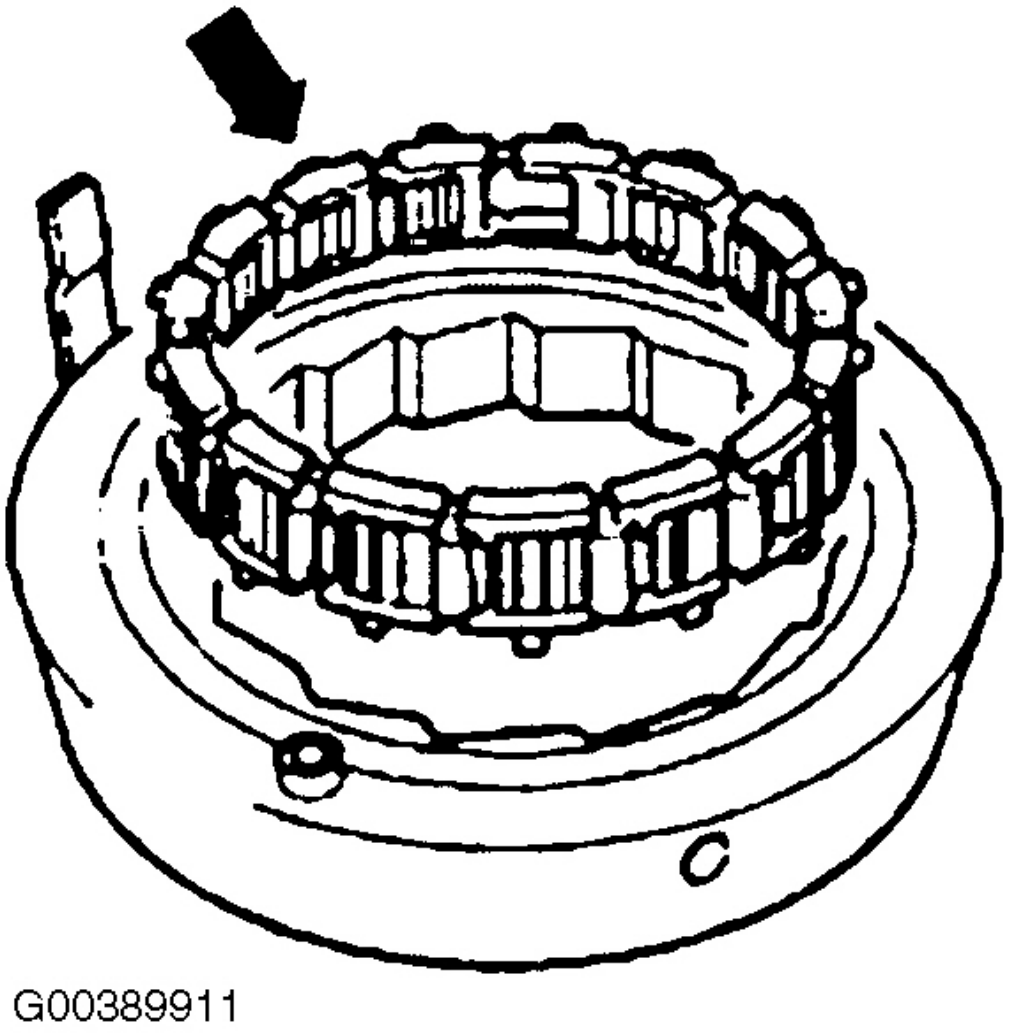

Fig. 118: Checking Synchro-Ring For Wear (Output Shaft)
Courtesy of VOLKSWAGEN OF AMERICA, INC.

- Press synchro-ring onto gear wheel cone and measure gap "a" with feeler gauge.

SYNCHRO-RING GAP DIMENSIONS WEAR LIMIT (OUTPUT SHAFT)

Gap "a"	New dimension	Wear limit

1st gear	1.0 ... 1.7 mm	0.5 mm
3rd gear	1.0 ... 1.7 mm	
4th gear	1.0 ... 1.7 mm	

Disassembling and assembling 1st and 2nd gear locking collar and synchro-hub

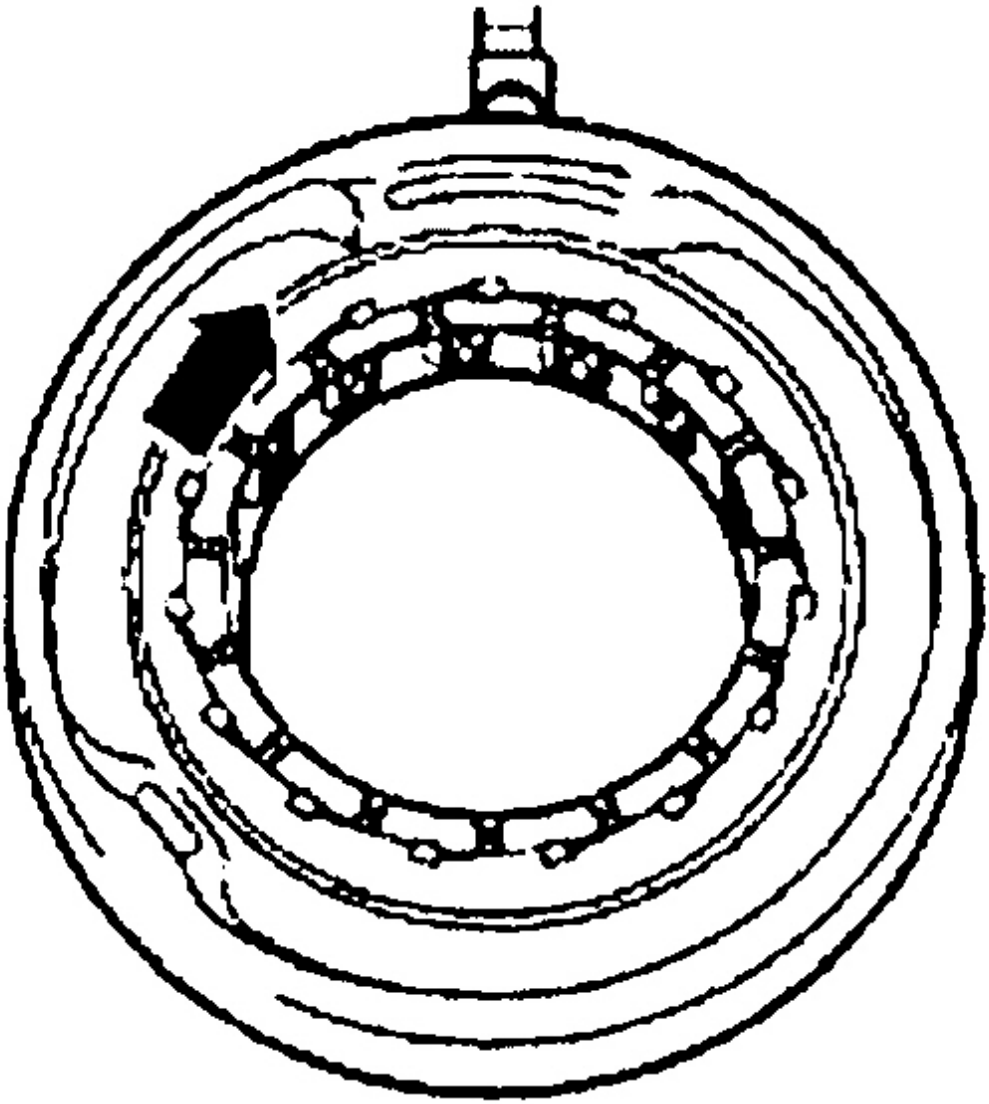

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Fig. 119: Disassembling And Assembling 1st And 2nd Gear Locking Collar And Synchro-Hub
Courtesy of VOLKSWAGEN OF AMERICA, INC.

1. Spring
2. Locking collar
3. Synchro-hub
4. Locking piece
    - Slide locking collar over synchro-hub.

      The wide shoulder of the synchro-hub (arrow -A-) and the outer splines of the locking collar (arrow -B-) face opposite directions after assembly. Recesses for locking pieces on synchro-hub and locking collar must align.

Assembling 1st and 2nd gear locking collar/synchro-hub

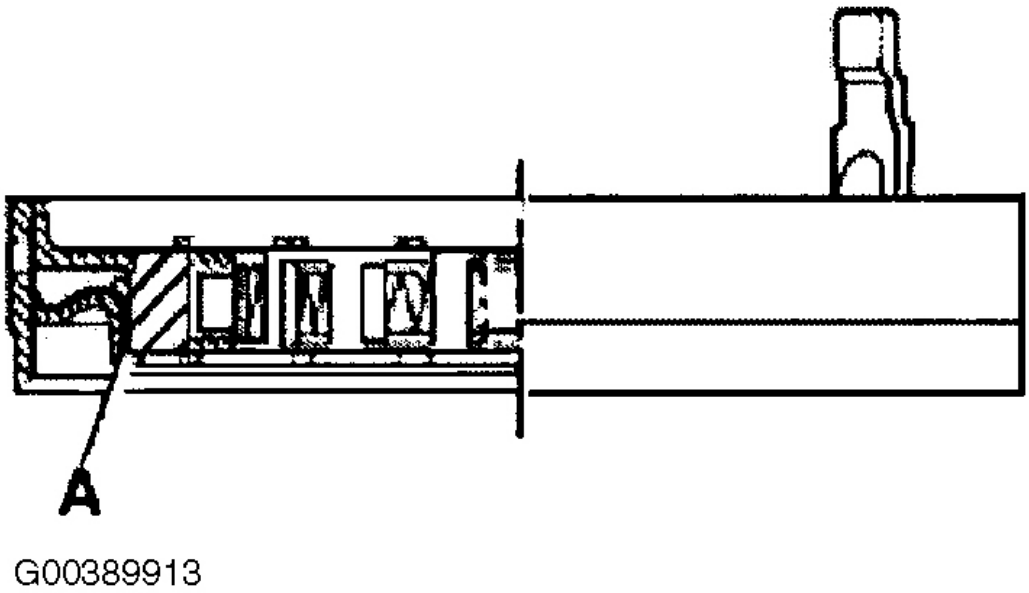


Fig. 120: Assembling 1st And 2nd Gear Locking Collar/Synchro-Hub
Courtesy of VOLKSWAGEN OF AMERICA, INC.

- Locking collar is pushed over synchro-hub.
    - Insert locking pieces and install springs 120° off-set. The angled end of spring must locate in hollow locking piece.

Installation position 1st and 2nd gear locking collar/synchro-hub

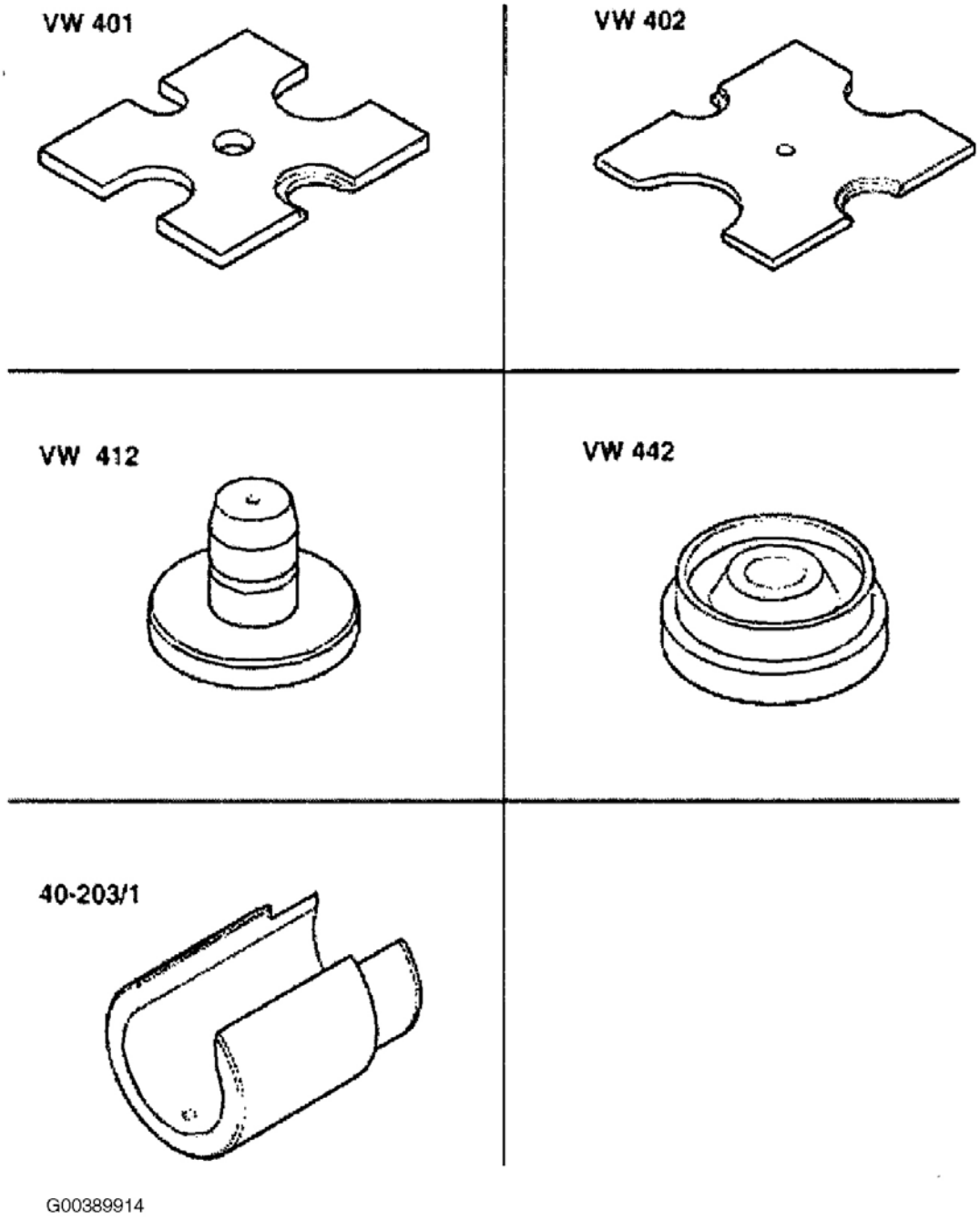
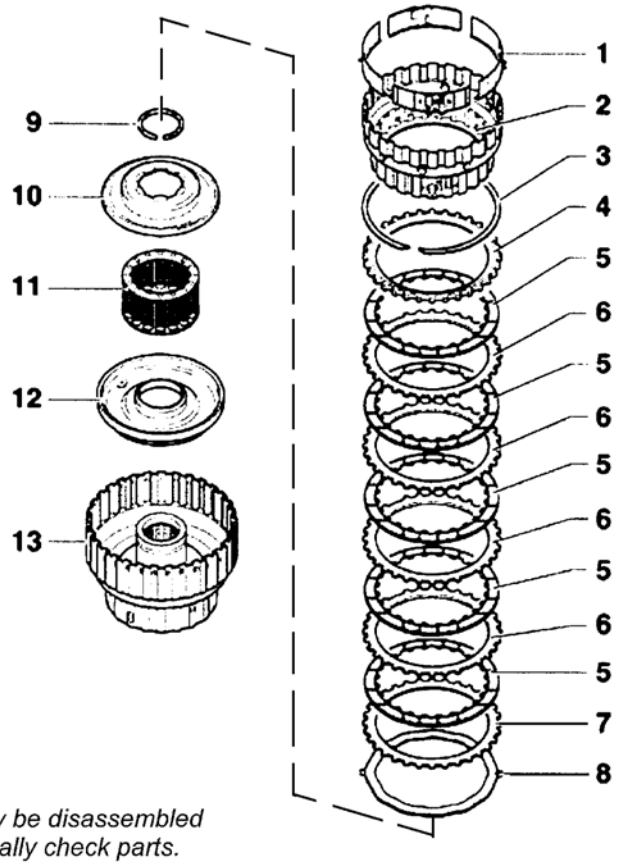


Fig. 121: Identifying Installation Position 1st And 2nd Gear Locking Collar/Synchro-Hub
Courtesy of VOLKSWAGEN OF AMERICA, INC.

The locking collar splines (arrow -1-) point to splines for 3rd/4th gear synchro-hub -A-.

The wide shoulder of the synchro-hub (arrow -2-) then faces to 1st gear -B-.

Pressing on 1st and 2nd gear locking collar/synchro-hub



Note:

The clutch should only be disassembled for cleaning or to visually check parts.

The clutches -K1- and -K3- are pressed together.

1 - Supporting ring
- 4-piece, unclip from inner plate carrier

2 - Inner plate carrier

3 - Circlip
- Different thicknesses
- Mark after removing and insert in same position

4 - Thrust plate
- Smooth side faces inner plate

5 - Inner plate

6 - Outer plate
- Always 1.5 mm thick

7 - Outer plate
- Always 2 mm thick

8 - Corrugated washer

9 - Circlip

10 - Piston cap
- Sealing lips are vulcanized to cap
- Moisten sealing lips with ATF before installing
- Turn cap slightly when installing

11 - Intermediate spring ring
- With spring supporting shell and compression springs

12 - Piston
- Sealing lips are vulcanized to piston
- Moisten sealing lips with ATF before installing
- Turn piston slightly when installing

13 - Clutch housing
- Before inserting the inner plate carrier corrugated washer (item -8-), insert inner and outer plates in clutch

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Fig. 122: Pressing On 1st And 2nd Gear Locking Collar/Synchro-Hub

Courtesy of VOLKSWAGEN OF AMERICA, INC.

NOTE: Before pressing on, place 1st gear synchro-ring on 1st gear wheel.

Identifying 1st and 2nd gear synchro-rings

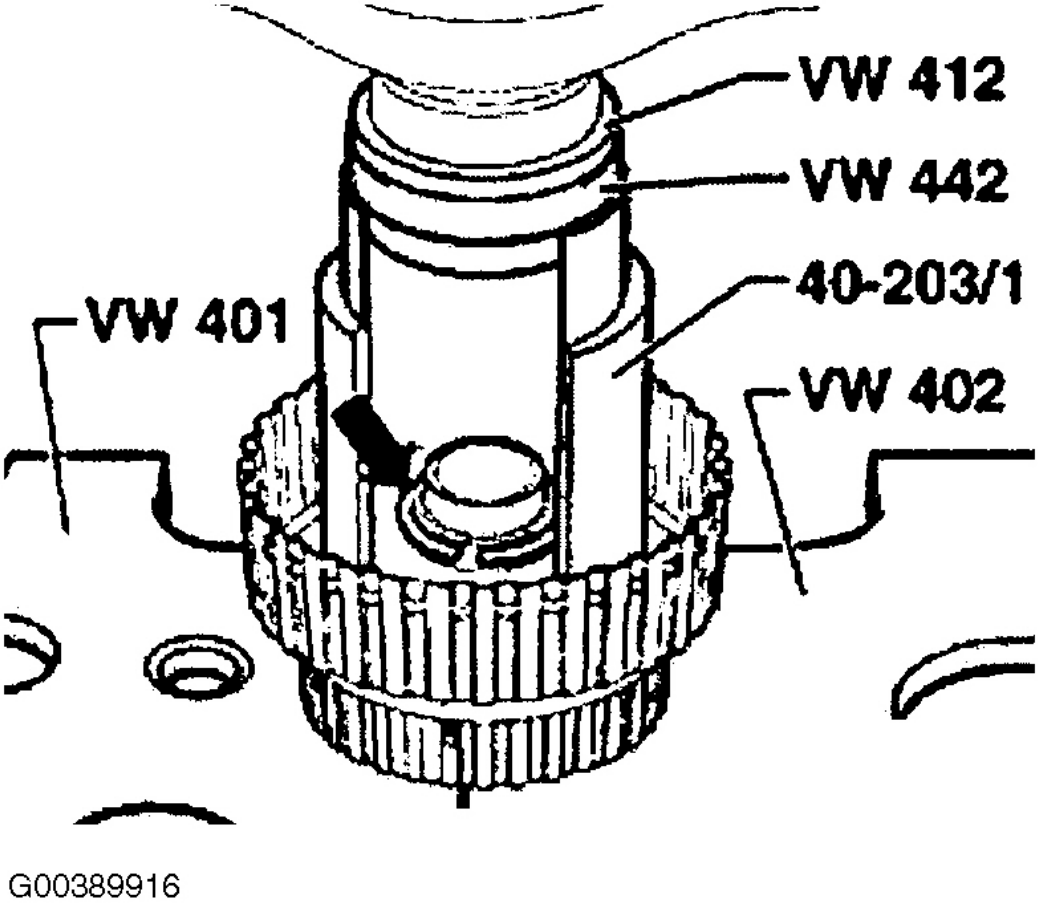


Fig. 123: Identifying 1st And 2nd Gear Synchro-Rings
Courtesy of VOLKSWAGEN OF AMERICA, INC.

- 1st gear synchro-ring: 3 x 1/2 ground-down half teeth (arrow)
- 2nd gear synchro-ring: 3x1/2 ground down half teeth (arrow) or 2 ground-down half teeth

  Only the version with 2x1/2 ground-down half teeth is available as a spare part for the 2nd gear synchro-ring.

Distinguishing 1st and 2nd gear synchro-rings

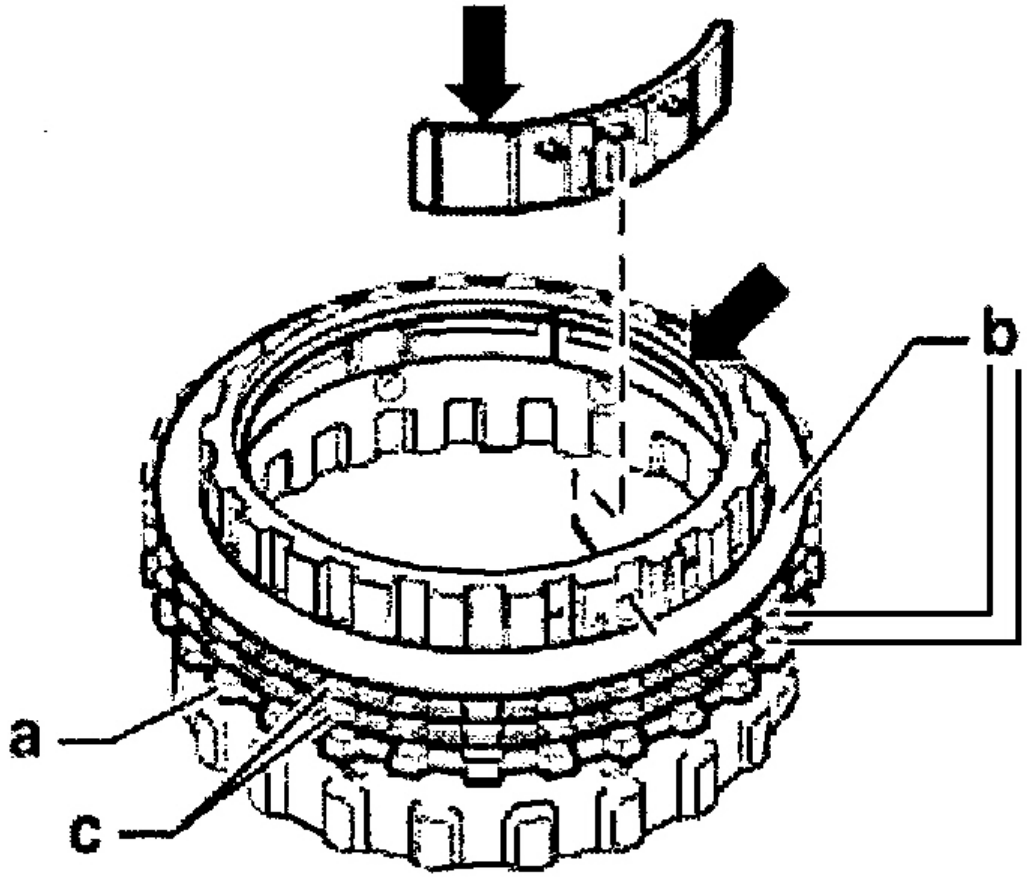


Fig. 124: Distinguishing 1st And 2nd Gear Synchro-Rings
Courtesy of VOLKSWAGEN OF AMERICA, INC.

- 1st gear synchro-ring - no recesses
- 2nd gear synchro-ring - three recesses (arrows)

Checking 2nd gear synchro-ring for wear

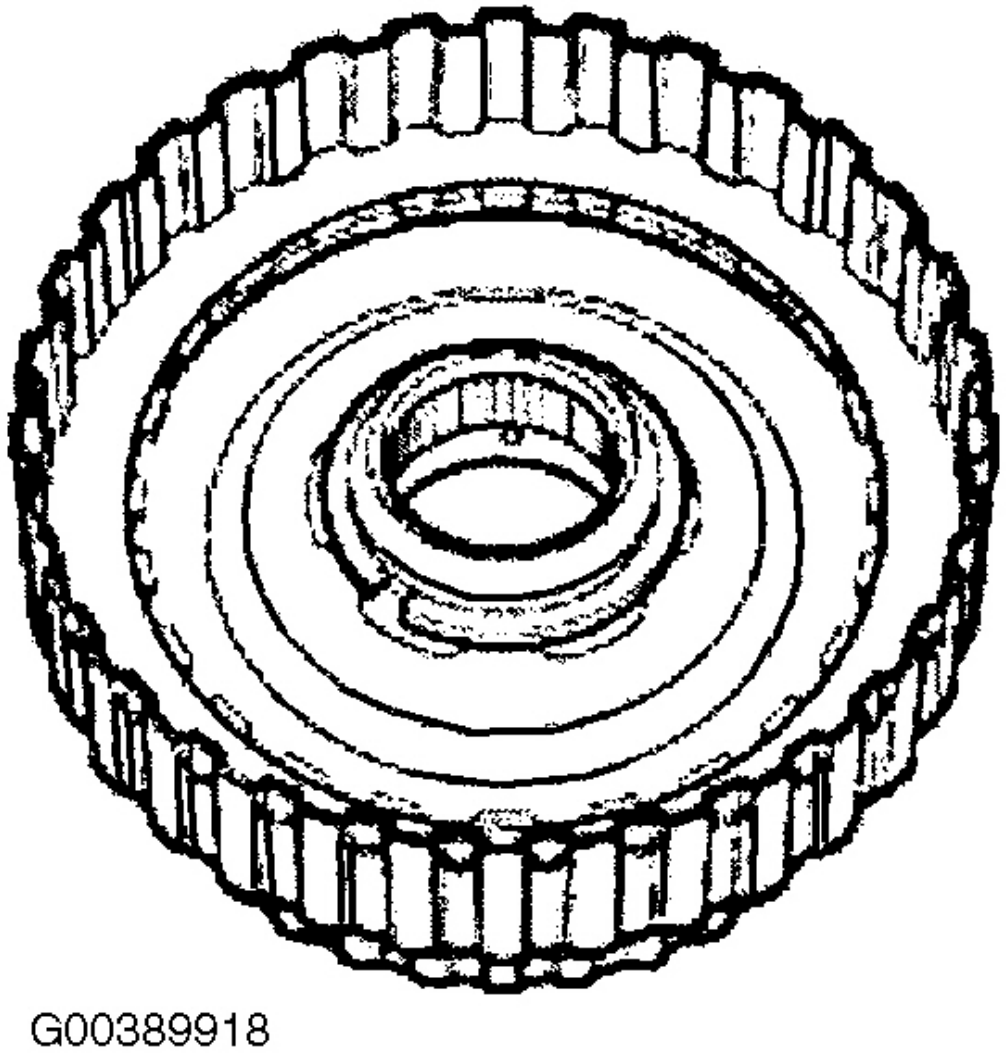


Fig. 125: Checking 2nd Gear Synchro-Ring For Wear
Courtesy of VOLKSWAGEN OF AMERICA, INC.

- Press synchro-ring, outer-ring and inner-ring onto gear wheel cone and measure gap "a" with feeler gauge.

2ND GEAR SYNCHRO-RING GAP DIMENSIONS WEAR LIMIT

Gap "a"	New dimension	Wear limit
2nd gear	1.2 ... 1.8 mm	0.5 mm

Installation position outer-ring

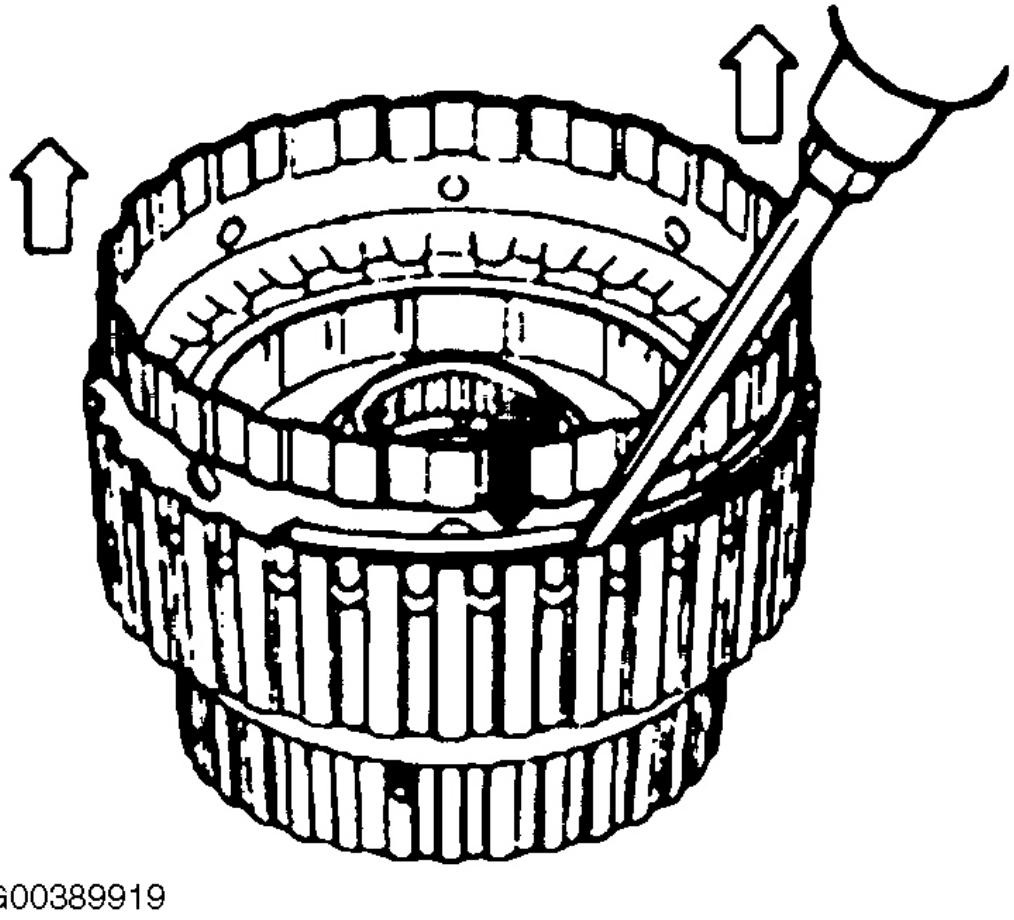


Fig. 126: Installation position outer-ring
Courtesy of VOLKSWAGEN OF AMERICA, INC.

The lugs (arrows) face to 1st gear -A-

Checking inner ring for wear

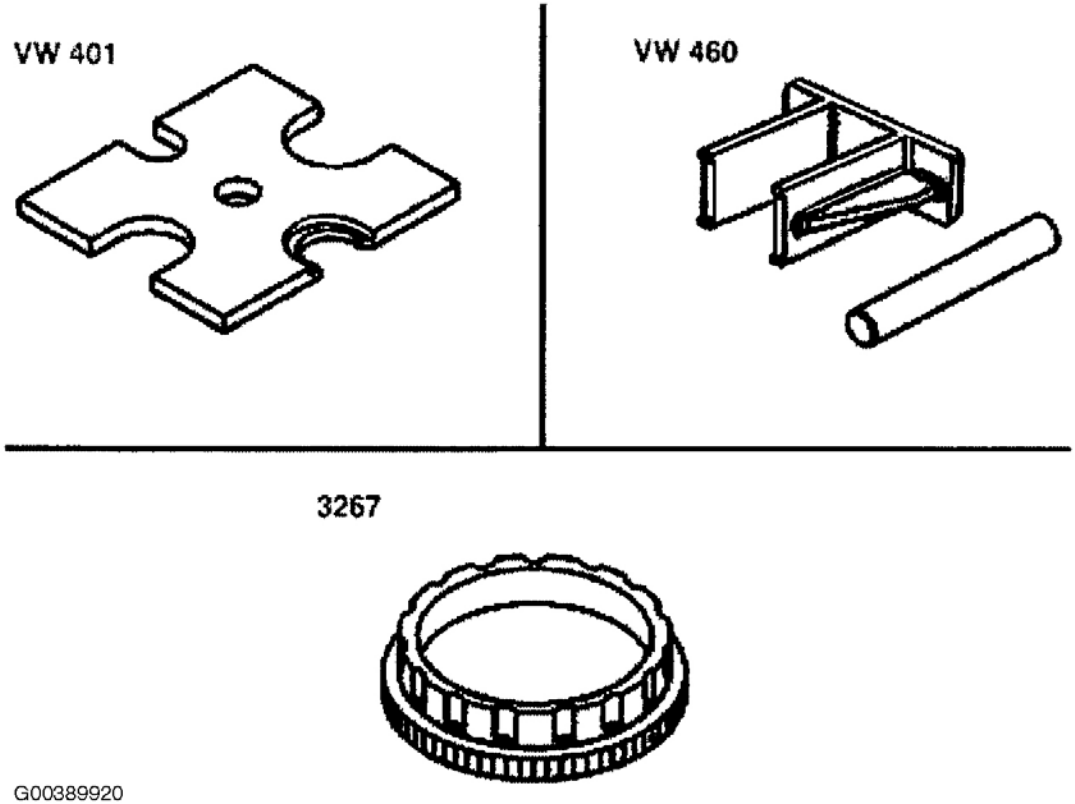


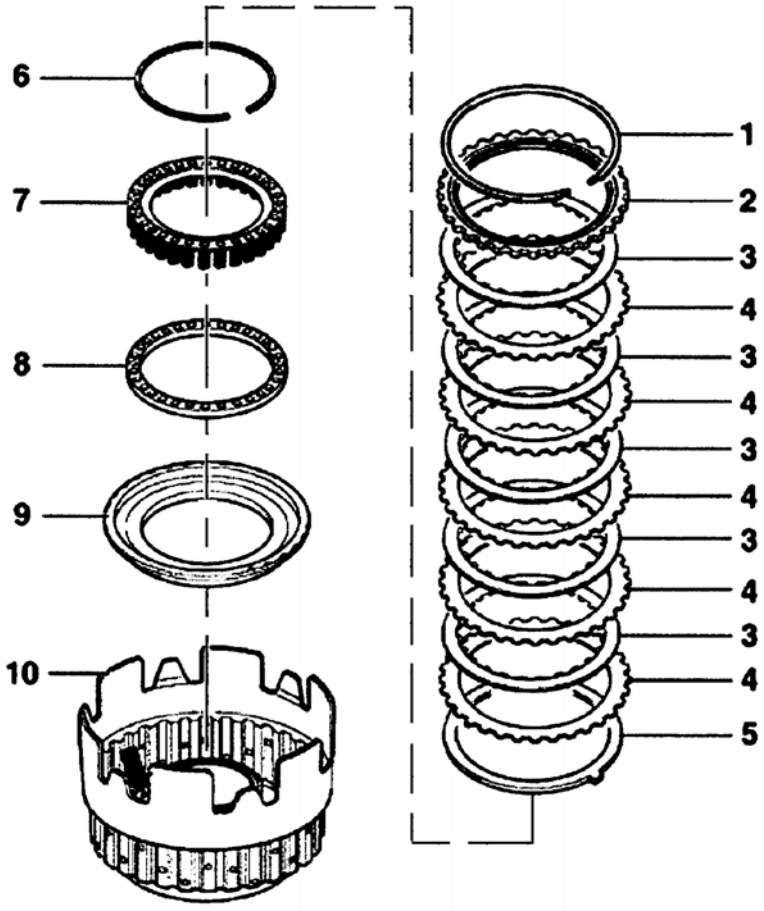
Fig. 127: Checking 2nd Gear Synchro-Ring Inner Ring For Wear
Courtesy of VOLKSWAGEN OF AMERICA, INC.

- Press inner ring onto 2nd gear wheel cone and measure gap "a" with a feeler gauge.

2ND GEAR SYNCHRO INNER RING GAP DIMENSIONS WEAR LIMIT

Gap "a"	New dimension	Wear limit
2nd gear	0.75 ... 1.25 mm	0.3 mm

Installation position synchro-ring (inner-ring)



Note:

- *The clutch should only be disassembled for cleaning or to visually check parts.*
- *When doing this ensure that the ball valve (arrow) is not damaged.*

1 - Circlip
- Mark after removing and insert in same position

2 - Thrust plate
- Smooth side facing inner plates

3 - Inner plate

4 - Outer plate

5 - Corrugated washer

6 - Circlip

7 - Spring supporting plate
- With springs

8 - Spring supporting ring

9 - Piston
- Sealing lips are vulcanized to piston
- Moisten sealing lips with ATF before installing
- Turn piston slightly when installing

10 - Clutch housing

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Fig. 128: Identifying Installation Position Synchro-Ring (Inner-Ring)
Courtesy of VOLKSWAGEN OF AMERICA, INC.

The lugs (arrow -1-) locate in the recesses (arrow -2-) in the synchro-ring -B-.

Installation position 2nd gear wheel

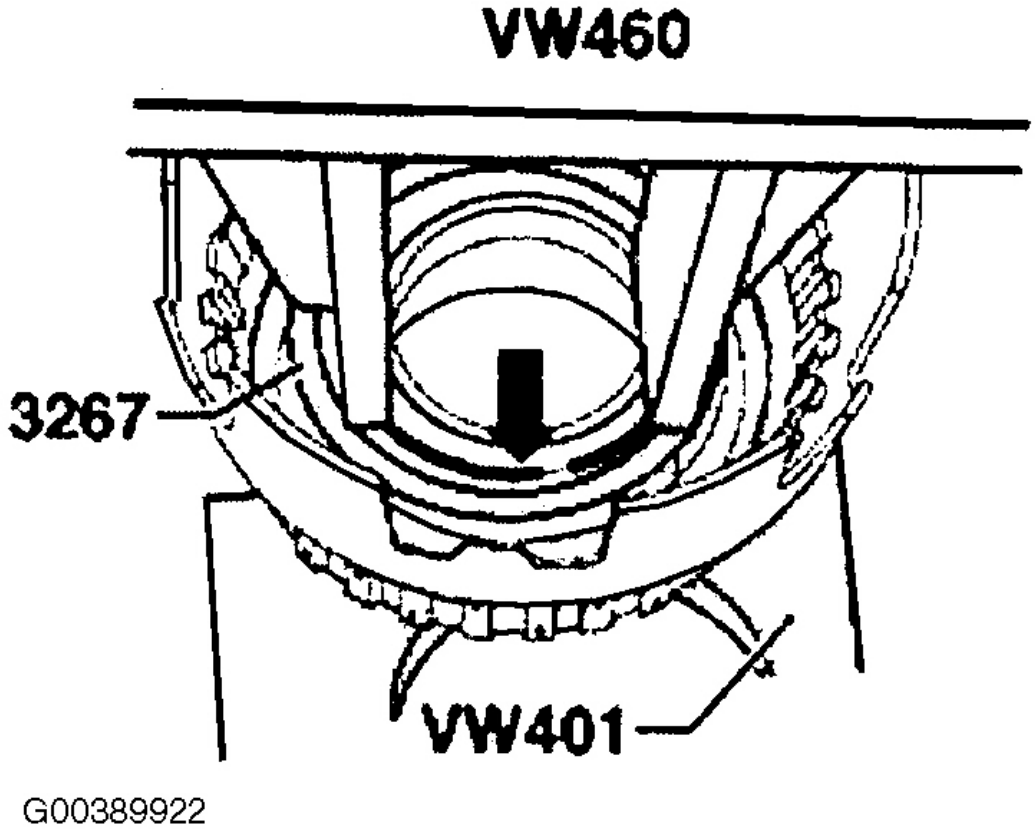

Fig. 129: Identifying Installation Position 2nd Gear Wheel
Courtesy of VOLKSWAGEN OF AMERICA, INC.

The higher shoulder -A- faces to 1st gear -B-. The recesses in the shoulder (arrows) locate with the lugs of the outer-ring (arrow. See **Installation position outer-ring**)

Pressing on needle roller bearing sleeve for 3rd gear

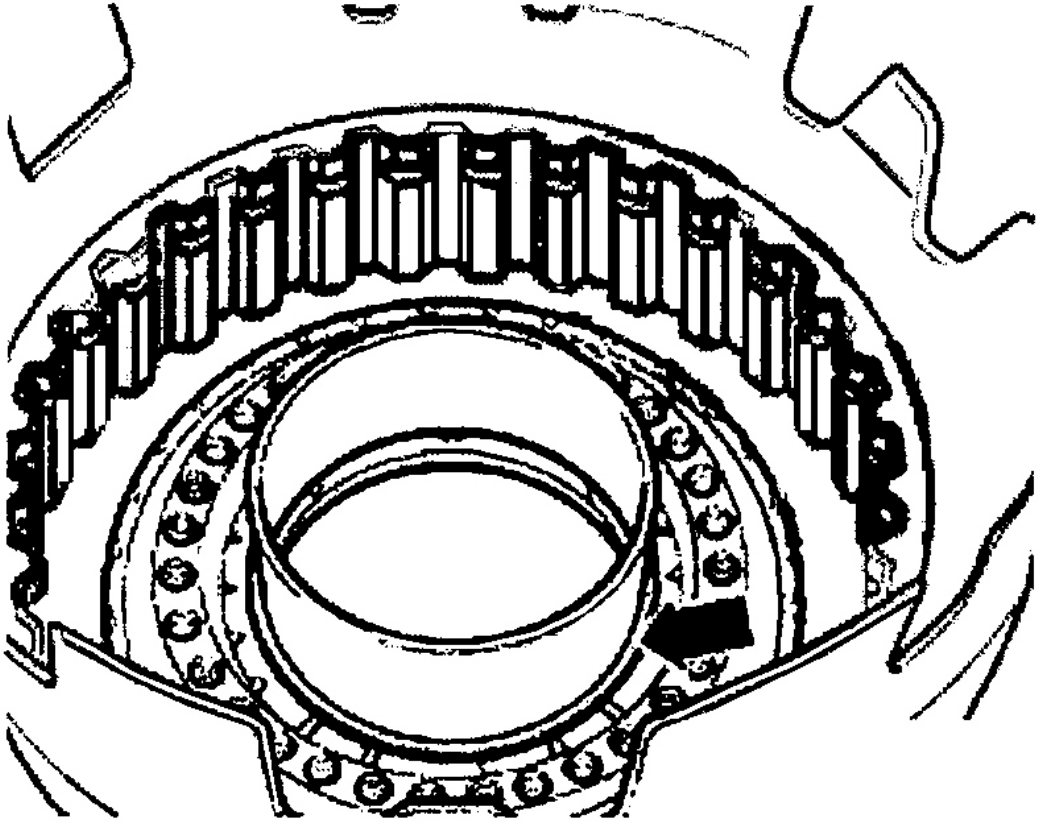

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Fig. 130: Pressing On Needle Roller Bearing Sleeve For 3rd Gear
Courtesy of VOLKSWAGEN OF AMERICA, INC.

Disassembling and assembling 3rd and 4th gear locking collar and synchro-hub

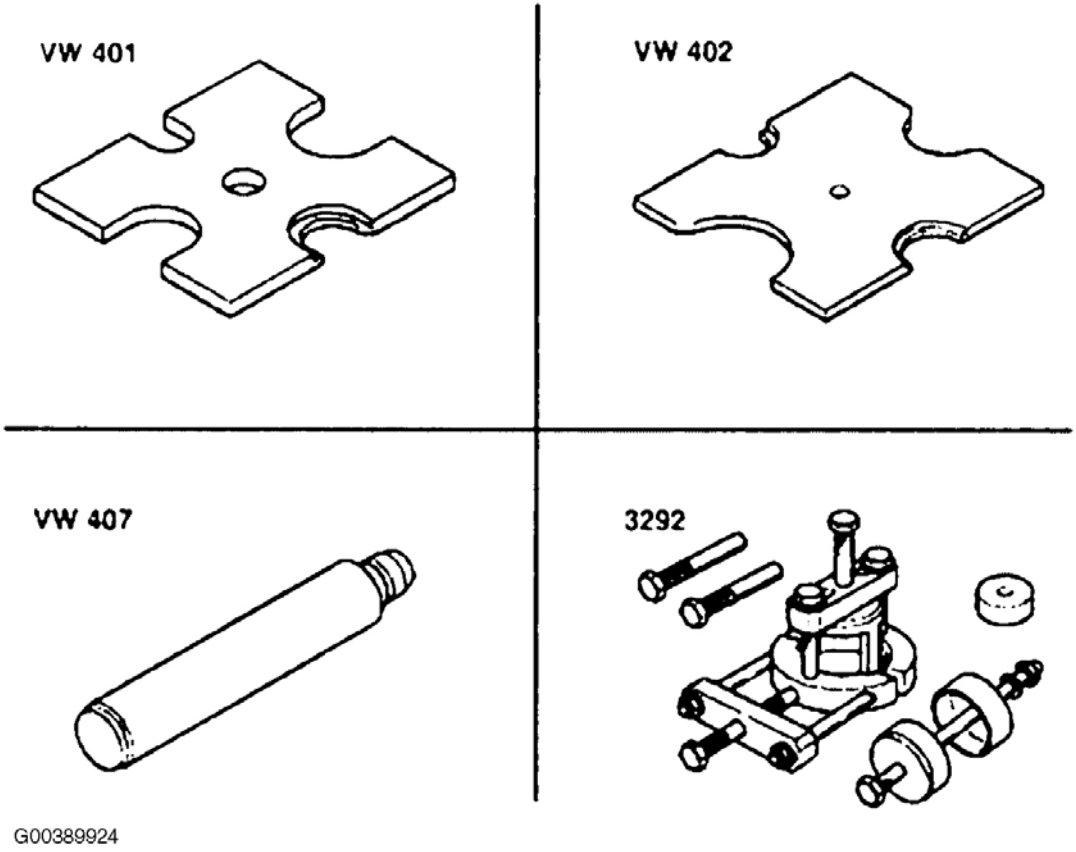
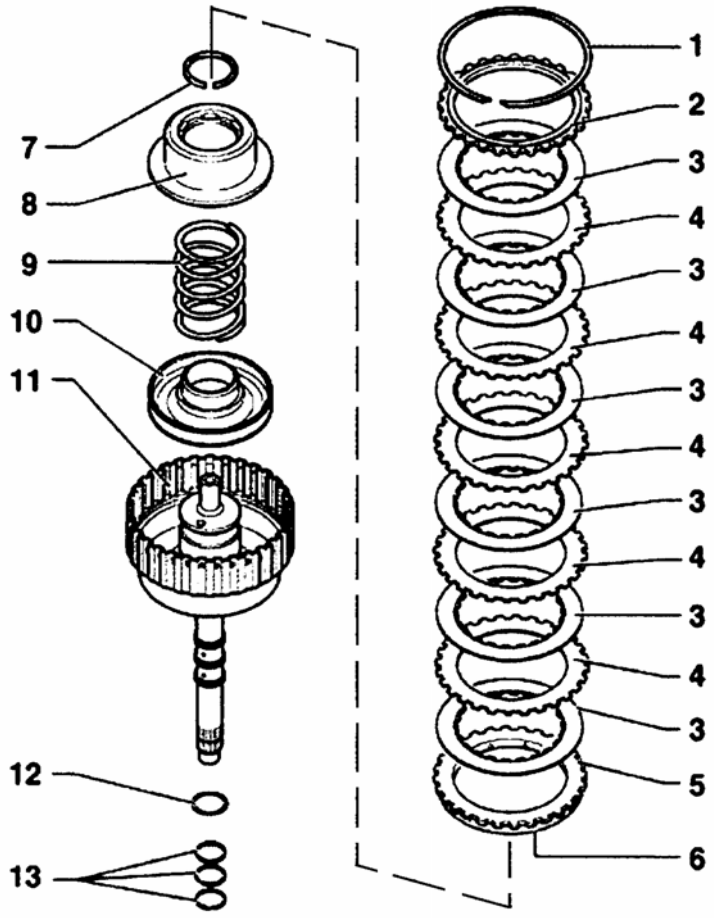


Fig. 131: Disassembling And Assembling 3rd And 4th Gear Locking Collar And Synchro-Hub
Courtesy of VOLKSWAGEN OF AMERICA, INC.

1. Spring
2. Locking piece
3. Locking collar
4. Synchro-hub
    - Slide locking collar over synchro-hub.

The recesses for locking pieces in synchro-hub and locking collar must align.

Assembling 3rd and 4th gear locking collar/synchro-hub



Note:

The clutch should only be disassembled for cleaning or to visually check parts.

The clutches -K1- and -K3- are pressed together.

1 - Circlip
- Different thickness
- Mark after removing and insert at same point

2 - Thrust plate
- Install with stepped side facing circlip

3 - Inner plate

4 - Outer plate

5 - Pressure plate
- Install with peened corrugated washer facing piston

6 - Corrugated washer
- Peened to pressure plate (item - 5 -)

7 - Securing ring

8 - Piston cap
- Sealing lips are vulcanized to piston cap
- Moisten with ATF before installing
- Turn piston cap slightly when installing
- When removing and installing press down and fit securing ring (item - 7 -)

9 - Spring
- Seat between piston and piston cap

10 - Piston
- Sealing lips are vulcanized to piston
- Moisten with ATF before installing
- Turn piston slightly when installing

11 - Clutch housing with turbine shaft
- Height varies according to number of inner and outer plates

12 - O-ring
- Always replace

13 - Piston ring

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Fig. 132: Assembling 3rd And 4th Gear Locking Collar/Synchro-Hub
Courtesy of VOLKSWAGEN OF AMERICA, INC.

The locking collar has been pushed over the synchro-hub.

If the locking pieces are inner hollow

- Insert locking pieces and install springs 120° off-set. Angled end of spring must locate in hollow locking piece.

If the locking pieces are not inner hollow

- Insert locking pieces and install springs 120° off-set. The spring must locate with the angled ends of the locking pieces.

Installation position 3rd and 4th gear locking collar/synchro-hub

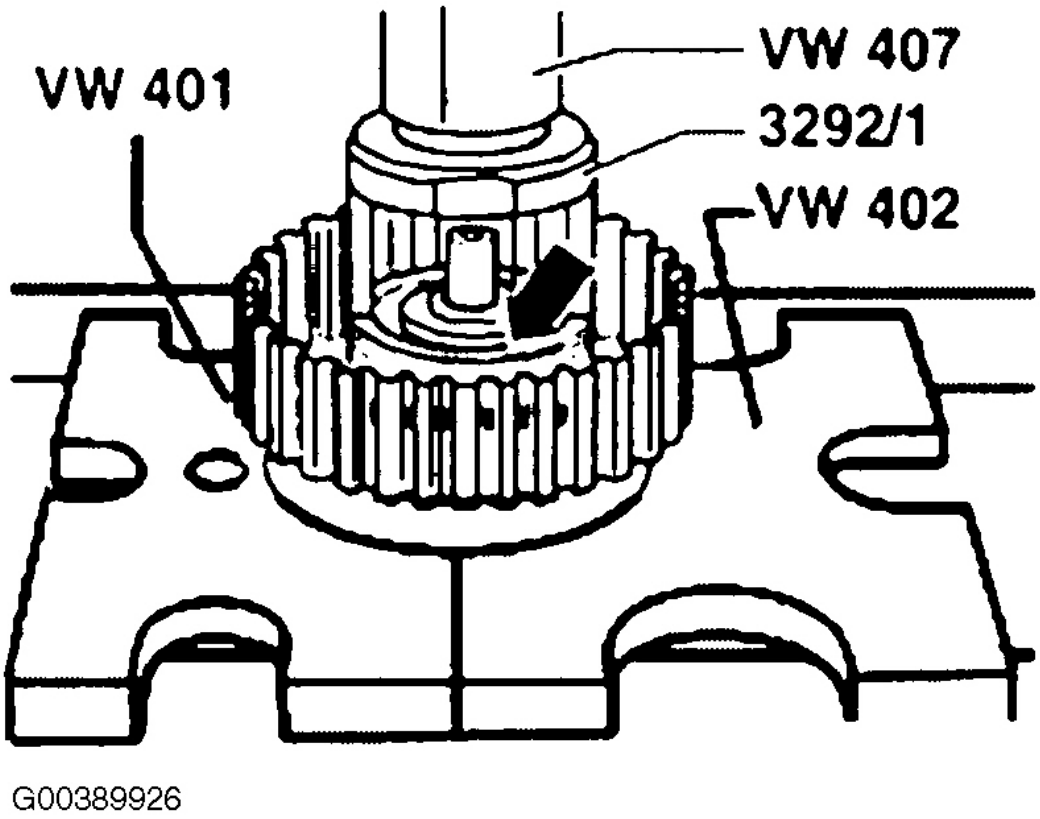

Fig. 133: Identifying Installation Position 3rd And 4th Gear Locking Collar/Synchro-Hub
Courtesy of VOLKSWAGEN OF AMERICA, INC.

Chamfer (arrow) faces to 4th gear.

Pressing on 3rd and 4th gear synchro-hub with locking collar

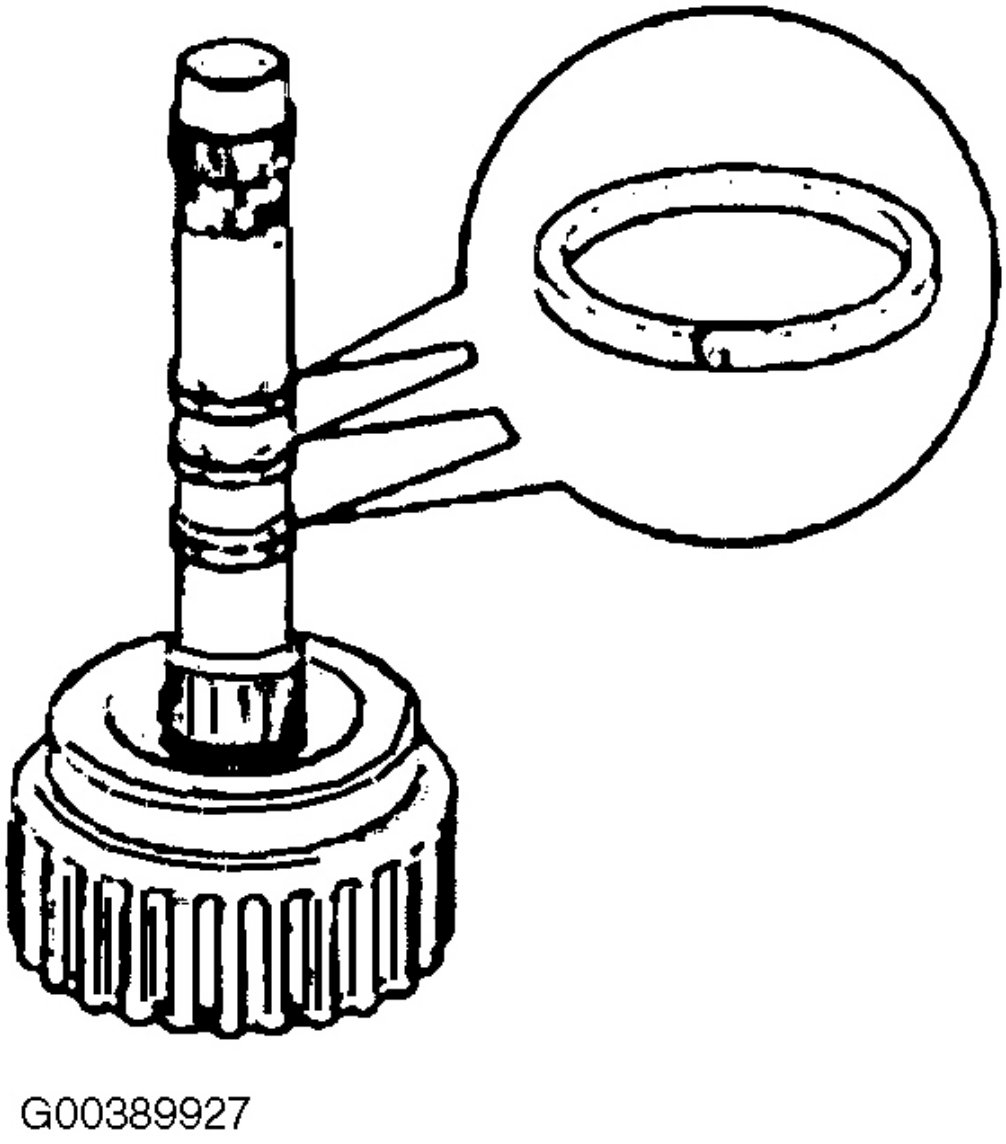

Fig. 134: Pressing On 3rd And 4th Gear Synchro-Hub With Locking Collar
Courtesy of VOLKSWAGEN OF AMERICA, INC.

Pressing on sleeve for 4th gear needle roller bearing

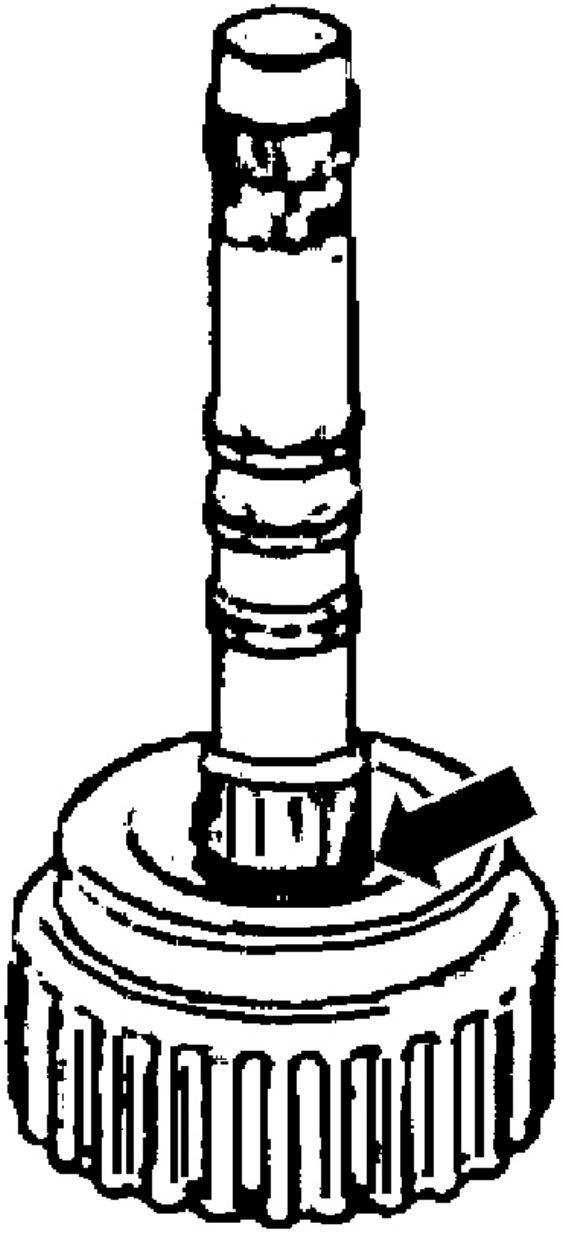

Fig. 135: Pressing On Sleeve For 4th Gear Needle Roller Bearing
Courtesy of VOLKSWAGEN OF AMERICA, INC.

Pressing on sleeve for output shaft needle roller bearing

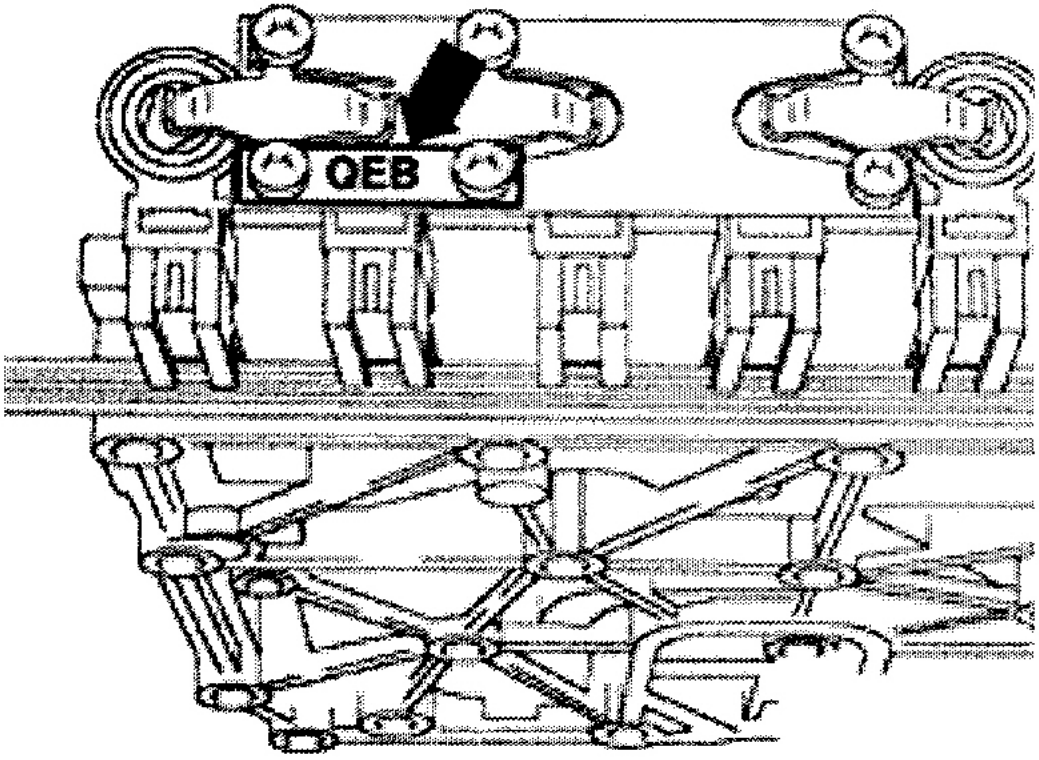

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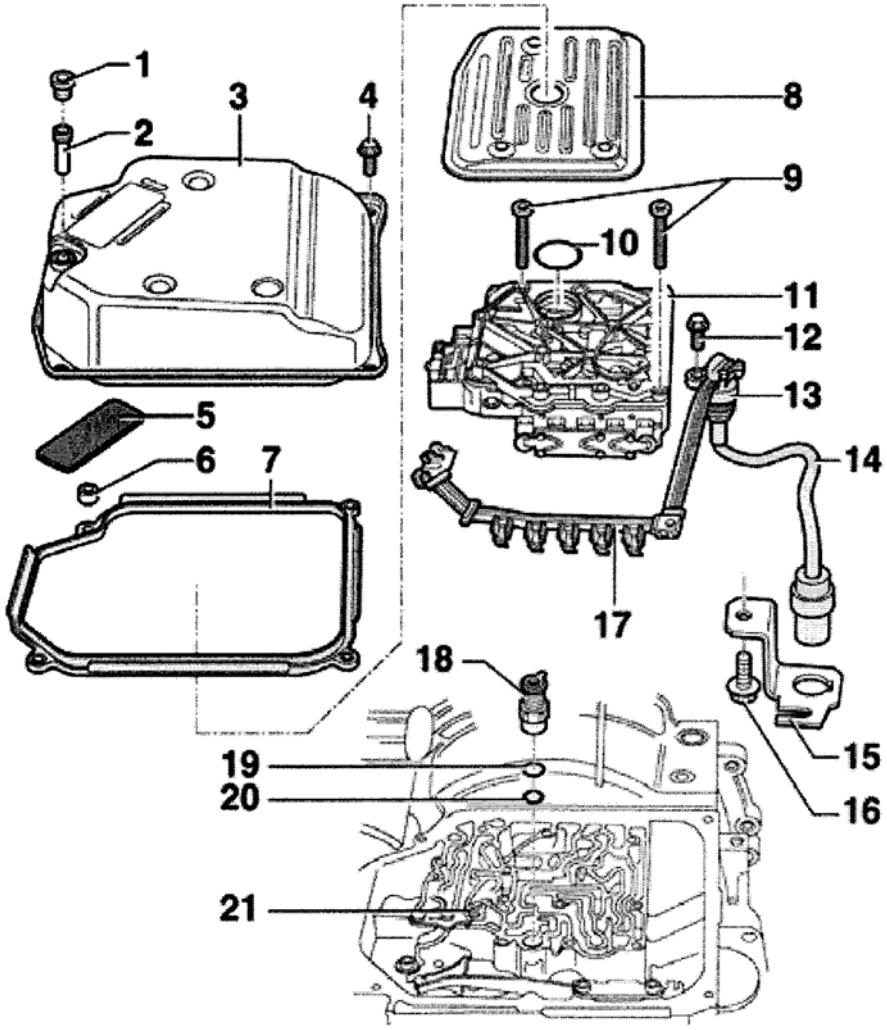
Fig. 136: Pressing On Sleeve For Output Shaft Needle Roller Bearing
Courtesy of VOLKSWAGEN OF AMERICA, INC.

Synchronizer for 1st gear has been modified, from transmission build date 02 05 0



1. ATF Level Plug
2. Overflow Pipe
3. Transmission Oil Pan
4. Oil Pan Bolt
5. Magnet
6. Spacer Bushing
7. Oil Pan Gasket
8. ATF Filter
9. Valve Body Bolt
10. Valve Body Gasket
11. Valve Body
12. Conductor Strip Bolt
13. O-Ring
14. Conductor Strip
15. Retaining Bracket
16. Retaining Bracket Bolt
17. Solenoid Valves Plug
18. Sealing Plug
19. O-Ring
20. O-Ring
21. Manual Selector Valve Operating Rod

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Fig. 137: Pressing On Sleeve For Output Shaft Needle Roller Bearing
Courtesy of VOLKSWAGEN OF AMERICA, INC.

The following components have been added or modified:

- A- Inner ring
- B- Outer ring
- C- Synchro-ring

  with additional recesses -4- for the lugs -1- of inner ring -A-.

- 1st gear wheel

with additional recesses -3- for the lugs -2- of outer ring -B-.

NOTE: For the 2nd gear the same inner ring, outer ring and synchro ring are installed.

- *If the components should not be replaced, ensure they are reallocated to the original gear .*

Installation position of inner ring, outer ring and synchro-ring 1st gear:

- Place inner ring -A- on 1st gear wheel.

  Angled lugs (arrow 1) point toward outer ring -B-.

- Install outer ring -B-.

  Lugs (arrow 2) engage in gear wheel recesses (arrow 3).

- Install synchro-ring -C-.

  The recesses (arrow 4) engage in lugs (arrow 1) of inner ring -A-.

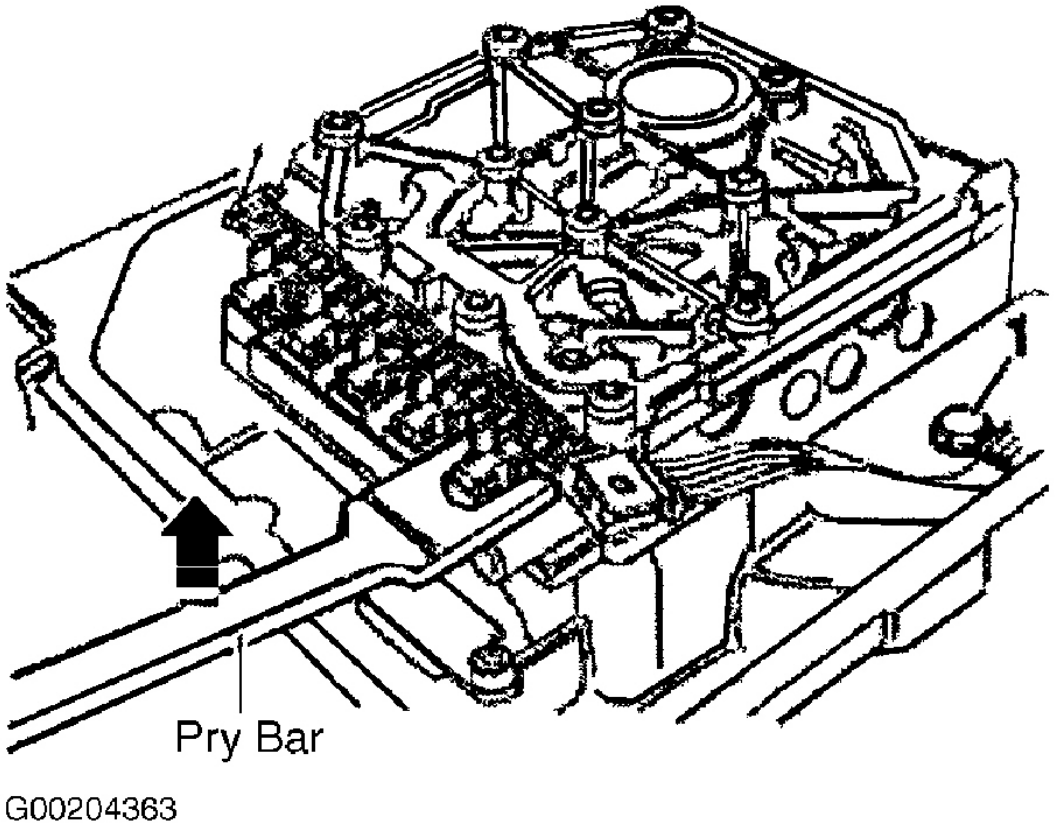

Fig. 138: Identifying Installation Position Of Inner Ring, Outer Ring And Synchro-Ring 1st Gear
Courtesy of VOLKSWAGEN OF AMERICA, INC.

Check inner ring 1st gear for wear

- Press inner ring onto gear wheel cone and measure gap "a" with a feeler gauge.

INNER RING 1ST GEAR GAP DIMENSIONS WEAR LIMIT

Gap "a"	New dimension	Wear limit
1st gear	0.75 ... 1.25 mm	0.3 mm

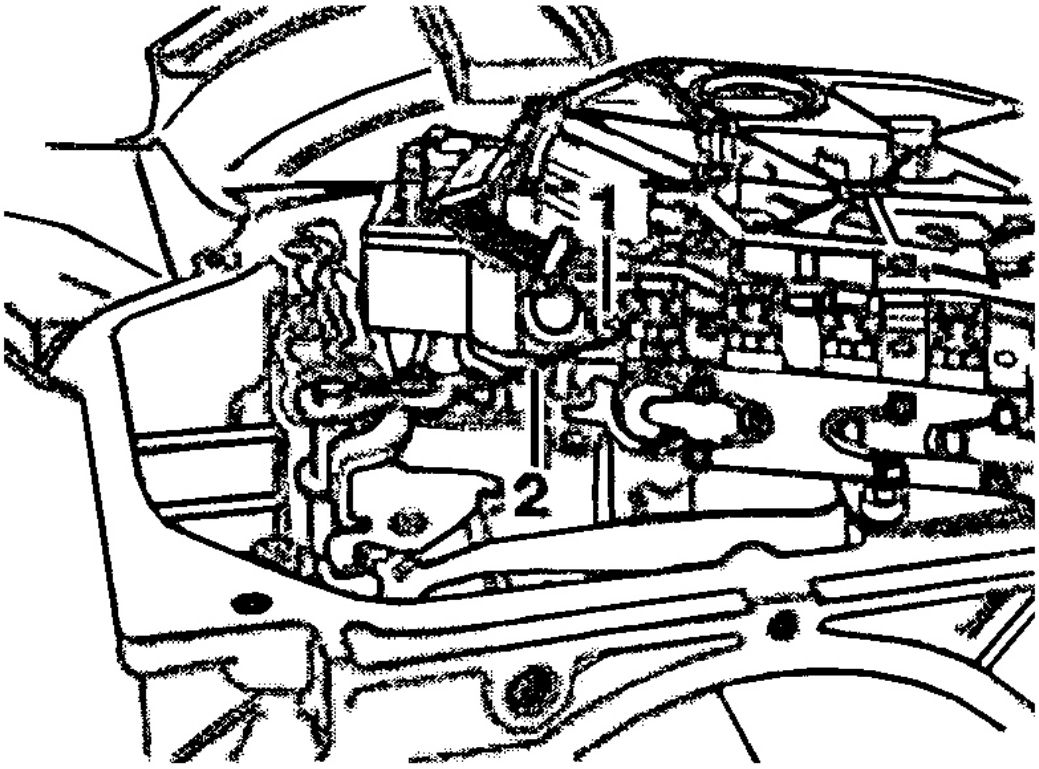

Fig. 139: Checking Inner Ring 1st Gear For Wear
Courtesy of VOLKSWAGEN OF AMERICA, INC.

Check synchro-ring 1st gear and outer ring for wear

- Press synchro-ring, outer-ring and inner-ring onto selector gear cone and measure gap "a" with feeler gauge.

SYNCHRO-RING 1ST GEAR AND OUTER RING GAP DIMENSIONS WEAR LIMIT

Gap "a"	New dimension	Wear limit
1st gear	1.2 ... 1.8 mm	0.5 mm

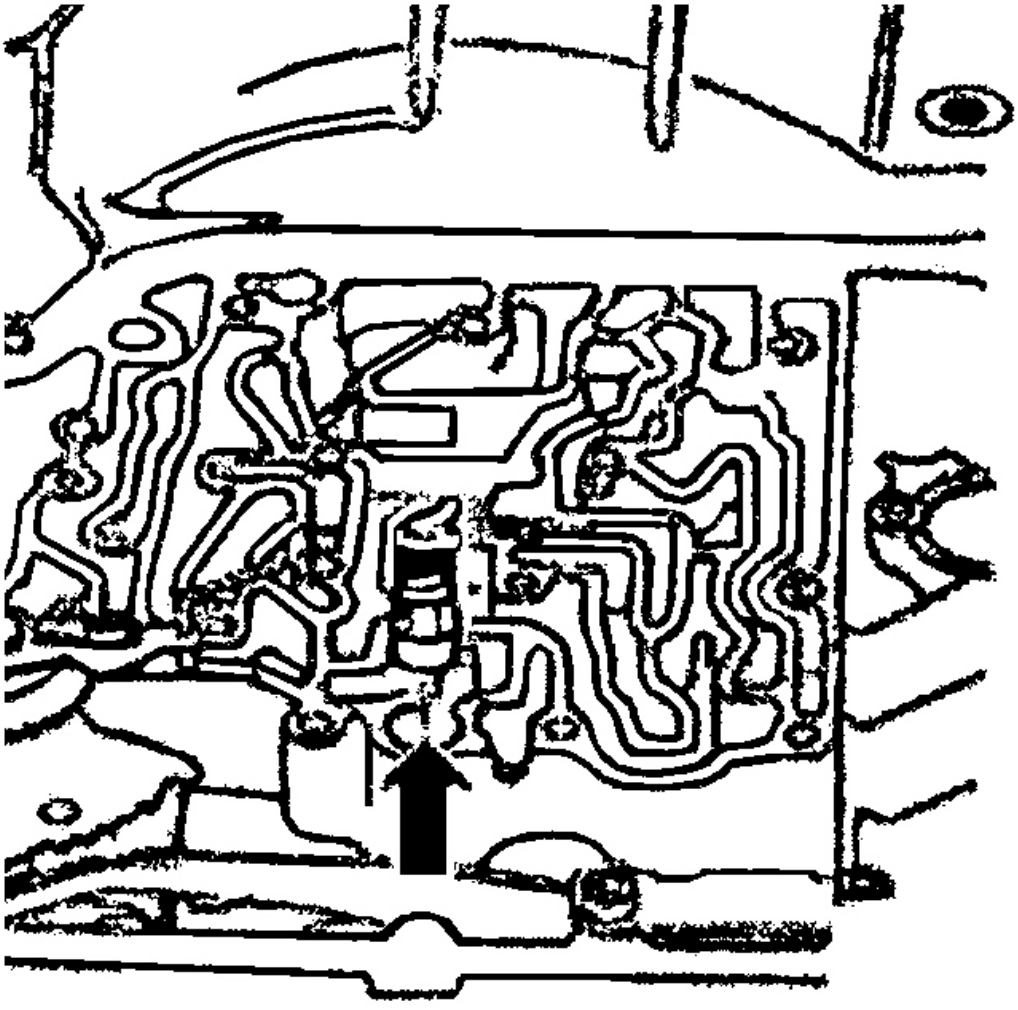

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Fig. 140: Checking Synchro-Ring 1st Gear And Outer Ring For Wear
Courtesy of VOLKSWAGEN OF AMERICA, INC.

Assembling locking collar and locking pieces with 1st and 2nd gear synchro-hub

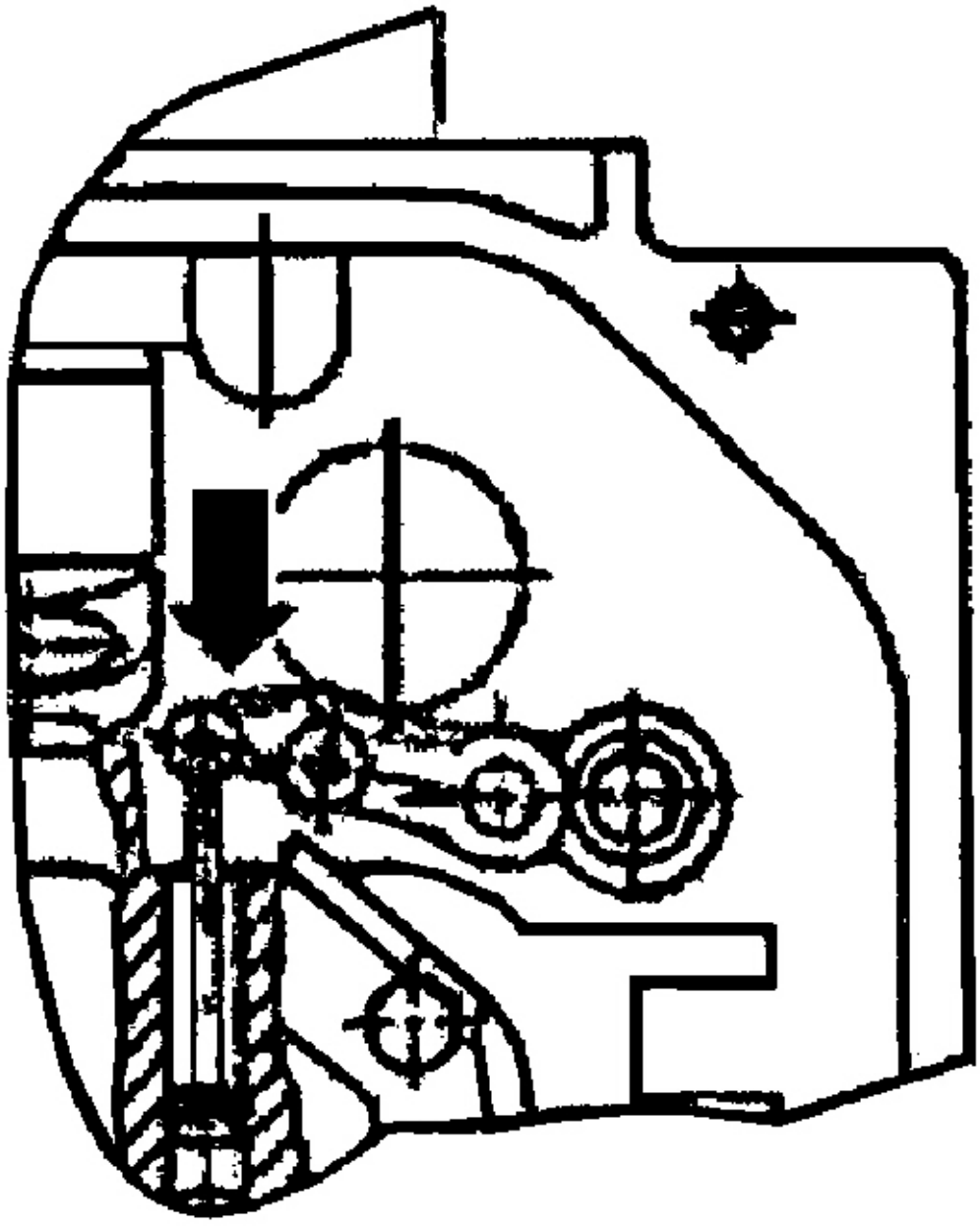

Fig. 141: Assembling Locking Collar And Locking Pieces With 1st And 2nd Gear Synchro-Hub
Courtesy of VOLKSWAGEN OF AMERICA, INC.

With introduction of the modified 1st gear synchronizer the shoulder has the same width on both sides of synchro-hub.

The shoulder has a chamfer on one side (arrow B).

After assembly the shoulder of the synchro-hub and the outer splines of the locking collar (arrow A) face same direction.

Recesses for locking pieces on synchro-hub and locking collar (arrow C) must align one over another.

Installation position of locking collar/synchro-hub 1st and 2nd gear

The locking collar splines (arrow) point to splines for 3rd/4th gear synchro-hub -A-.

- Remove the 1st gear synchro-hub as described and install again.

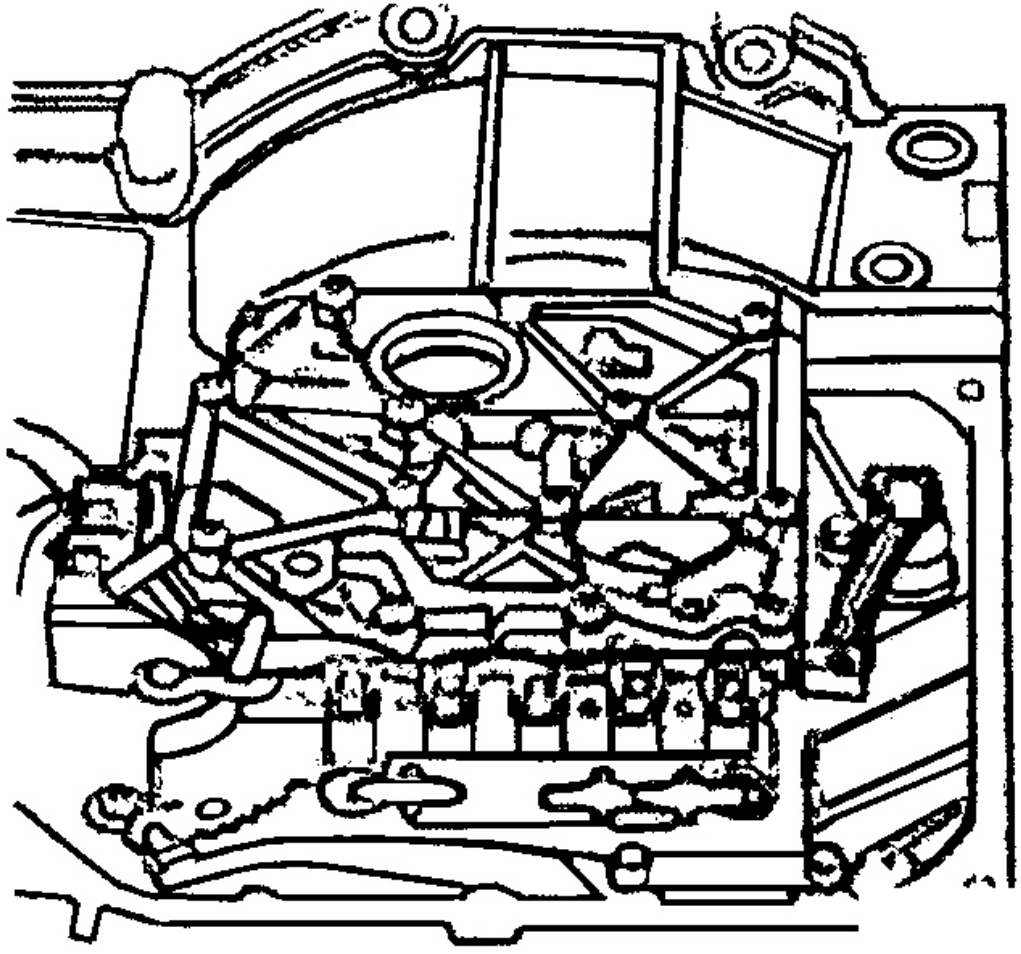

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Fig. 142: Identifying Installation Position Of Locking Collar/Synchro-Hub 1st And 2nd Gear
Courtesy of VOLKSWAGEN OF AMERICA, INC.

OUTPUT SHAFT, ADJUSTING

(Determining shim for output shaft)

Special tools and equipment

- VW 387 Universal dial gauge bracket
- VW 385/17 End measuring plate

- VW512 Press disk3114/2 Straightening tool
- VW 407 Press tool
- V.A.G1331 Torque wrench
- Measuring dial gauge

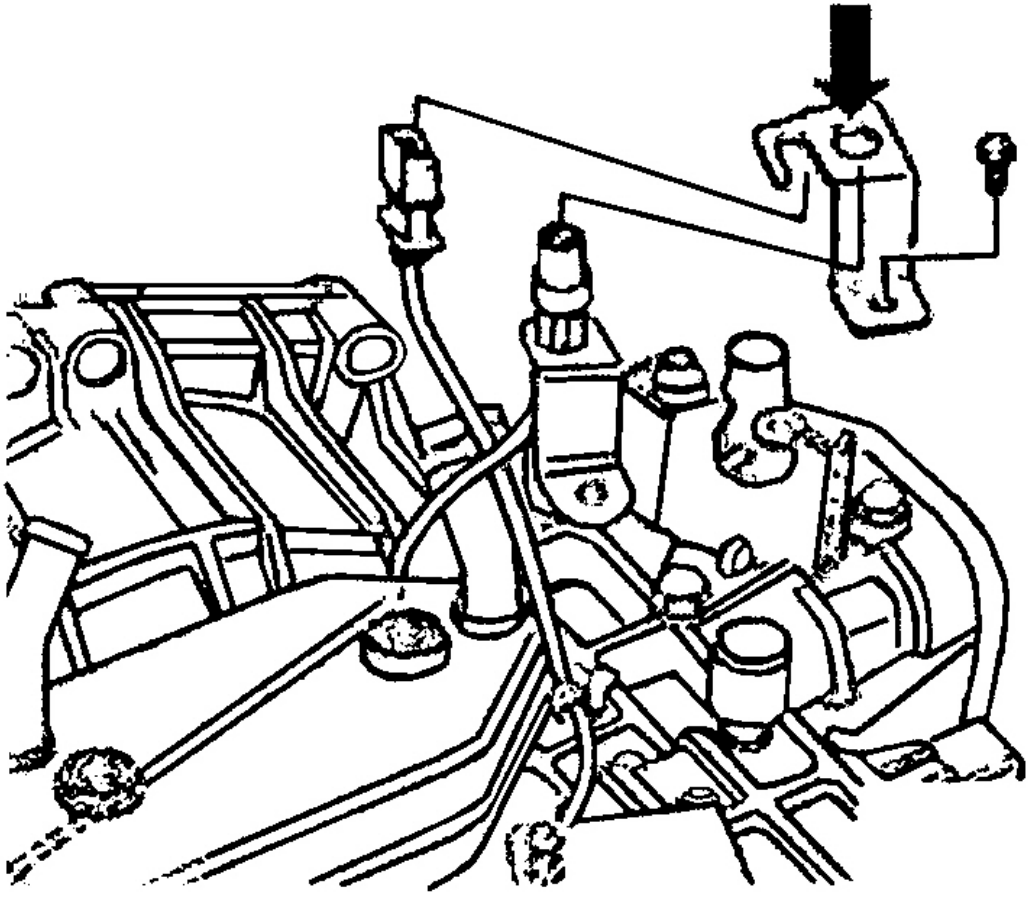


Fig. 143: Identifying Special Tools And Equipment (1 Of 2)
Courtesy of VOLKSWAGEN OF AMERICA, INC.

- 1 - Kukko 21/6 Internal extractor
- 4 - Kukko 22/2 Retainer

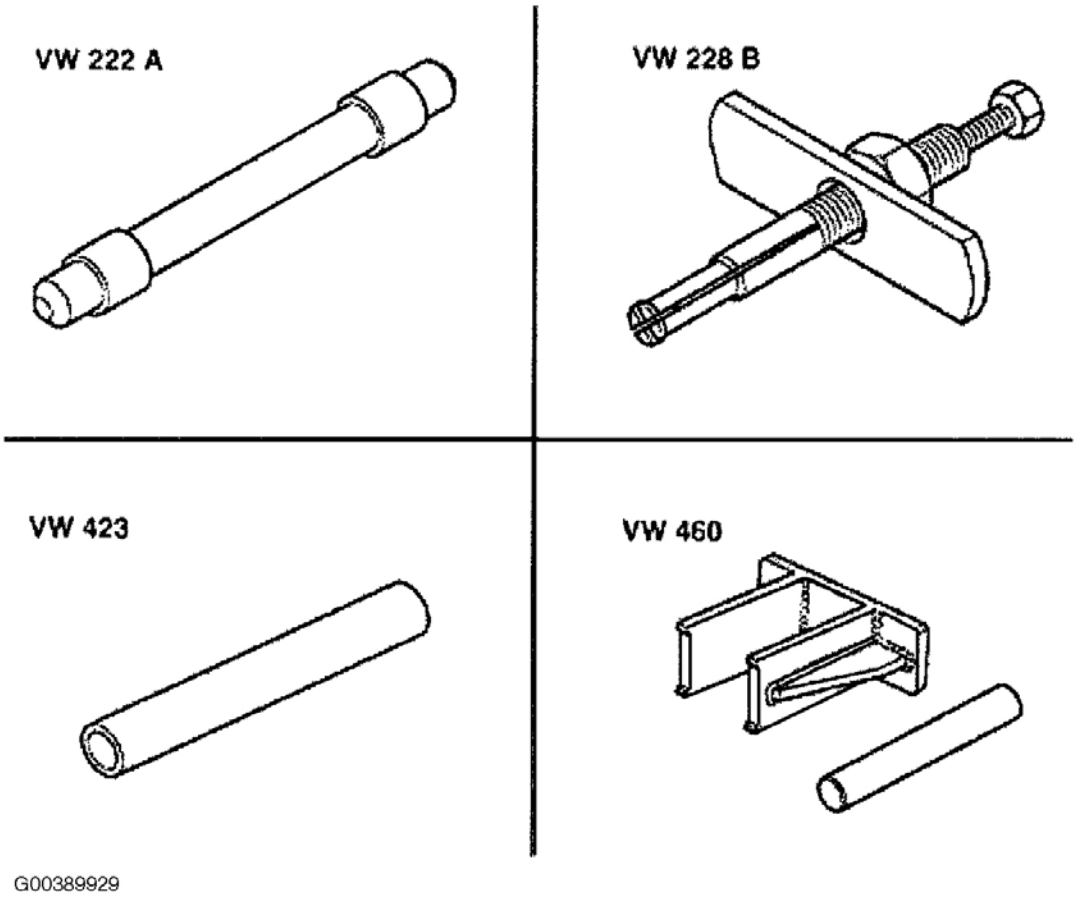


Fig. 144: Identifying Special Tools And Equipment (2 Of 2)
Courtesy of VOLKSWAGEN OF AMERICA, INC.

It is necessary to readjust the output shaft when the following components are replaced:

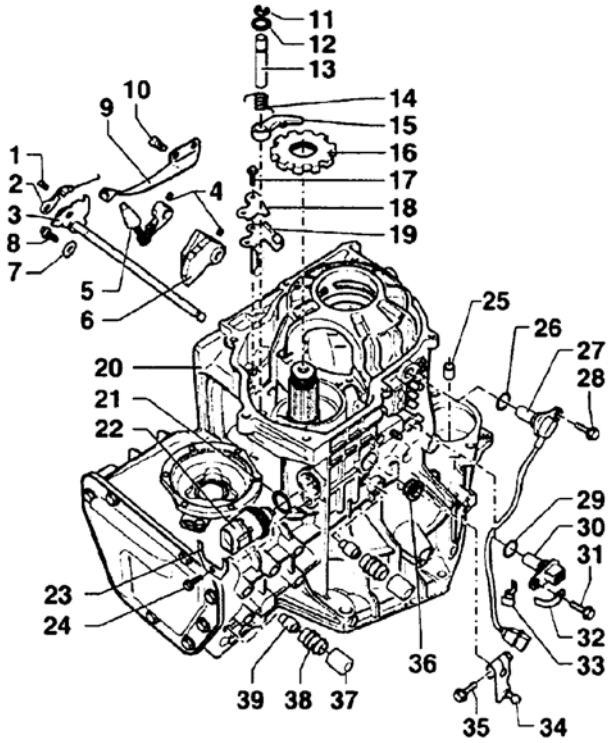
- Final drive
- Clutch housing

  or

- Tapered roller bearing

  Adjustment overview. See **Adjustment overview**

- Press small tapered roller bearing outer race together with a 0.65 mm thick shim into clutch housing. See **Output shaft, disassembling and assembling** .
- Insert output shaft and tighten nuts for bearing support to 25 N.m, then turn 90°.
- Mount dial gauge (3 mm measuring range) and set to "0" with 1 mm preload.



Note:
The output gear must be removed to disassemble and assemble the parking lock.

1. Bolt, 4 Nm
2. Manual Selector Valve Control
3. Selector Shaft With Selector Segment
4. Spring Pin
5. Engaging Lever
   Insert together with selector shaft and detent segment
6. Detent Segment
   Insert together with selector shaft and engaging lever
7. Locking Washer
8. Bolt, 10 Nm
9. Spring For Selector Segment
10. Bolt, 10 Nm
11. O-Ring (Always replace)
    Only install on shafts with groove for circlip
12. Washer
13. Shaft For Detent Lever
    Is secured by circlip and bearing cap of drive pinion
14. Return Spring
15. Detent Lever
16. Parking Lock Gear
    Rounded side faces teeth of drive pinion
17. Bolt, 14 Nm
18. Supporting Plate
19. Guide Plate
    Insert before supporting plate
20. Transmission Housing
    It is not necessary to remove the drive gear to disassemble the parking lock
21. O-Ring (Always replace)
22. Multi-Function Transmission Range (TR) Switch -F125-
23. Retainer
    For multi-function TR switch
24. Bolt, 10 Nm
25. Mounting Bushing
26. O-Ring (Always replace)
27. Vehicle Speed Sensor -G68-
28. Bolt, 10 Nm
29. O-Ring (Always replace)
30. Transmission Vehicle Speed Sensor -G38-
31. Bolt, 10 Nm
32. Retainer
    For wire to vehicle speed sensor
    Secure with bolt -item 31 -
33. Retaining Clip
    For wire to vehicle speed sensor
34. Lever
    For selector shaft
35. Bolt, 10 Nm
36. O-Ring
    Pry out with screwdriver
    Drive in flush with VW 423
37. Breather Cap
38. Breather
39. Breather Pipe
    Remove using pliers
    Drive onto stop with drift VW 460/2

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Fig. 145: Mounting Dial Gauge With 1 mm Preload
Courtesy of VOLKSWAGEN OF AMERICA, INC.

- Move output shaft up and down and note dial gauge reading (example: 0.30 mm).

Determining thickness of shim

The specified bearing preload is obtained by adding a constant preload figure of (0.20 mm) to the reading obtained (0.30 mm) and the thickness of the shim installed (0.65 mm).

Example:

DETERMINING THICKNESS OF SHIM (EXAMPLE)

Shim installed	0.65 mm
+ Reading	0.30 mm
+ Preload (constant)	0.20 mm
Thickness of shim	1.15 mm

- Remove output shaft and pull out small tapered roller bearing outer race. See **Output shaft, disassembling and assembling**

The following adjustment shims are available:

SHIM THICKNESS SPECIFICATION (OUTPUT SHAFT)

Size (mm)	**Part No.**
0.65	020 311 391 P
0.70	020 311 391 Q
0.75	020 311 391
0.80	020 311 391 A
0.85	020 311 391 B
0.90	020 311 391 C
0.95	020 311 391 D
1.00	020 311 391 E
1.05	020 311 391 F
1.10	020 311 391 G
1.15	020 311 391 H
1.20	020 311 391 J
1.25	020 311 391 K
1.30	020 311 391 L
1.35	020 311 391 M
1.40	020 311 391 N

Varying tolerances make it possible to obtain the exact shim thickness required.

- Press in small tapered roller bearing outer race together with correct shim (See **Output shaft, disassembling and assembling**) and install output shaft. Tighten bearing support nuts in clutch housing

to 25 N.m an additional 1/4 turn 90°.

REVERSE SHAFT, DISASSEMBLING AND ASSEMBLING

Special tools and equipment

- VW 454 Press piece
- VW 447 H Press plate
- VW 411 Press tool
- 12-551 Centering mandrel
- VW 401 Press plate
- VW 408 A Press tool

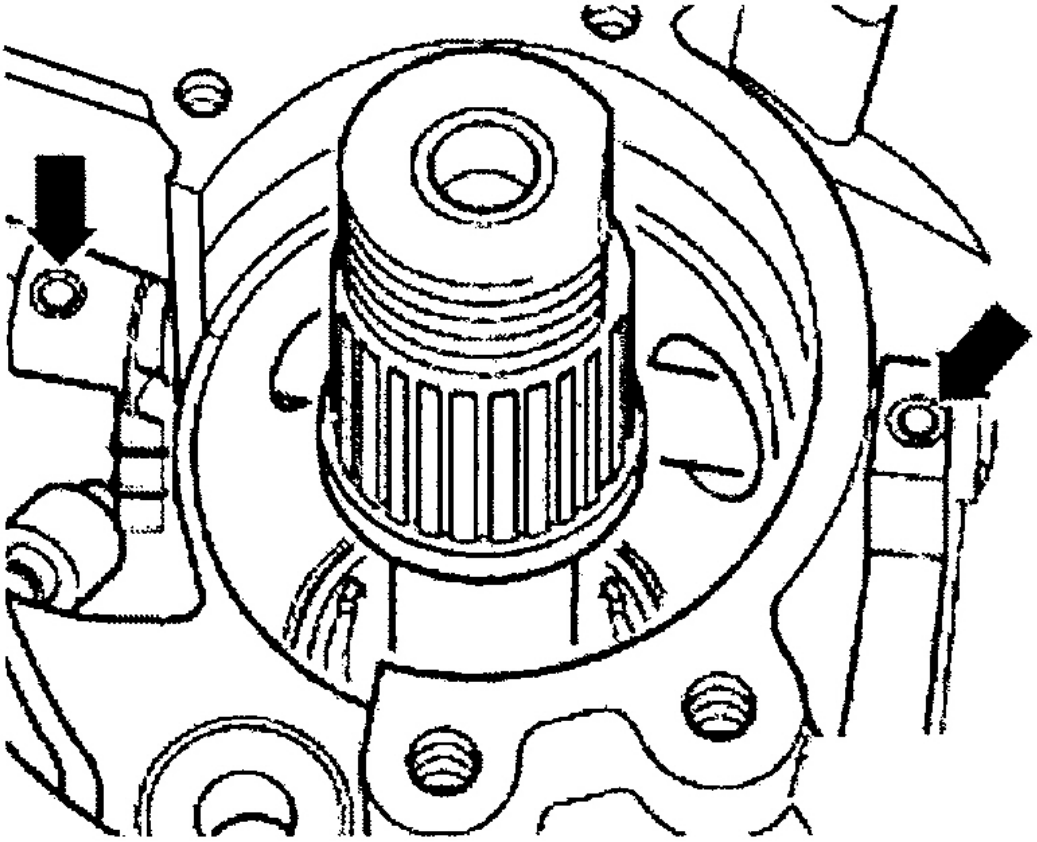

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Fig. 146: Identifying Special Tools And Equipment

Courtesy of VOLKSWAGEN OF AMERICA, INC.

NOTE: After disassembling, always replace needle roller bearing in clutch housing and reverse shaft support.

NOTE: The following list refers to items in Fig. 147 .

1. **Clutch housing**
2. **Needle roller bearing**
   - Pulling out. See **Pulling needle roller bearing out of clutch housing**
   - Pressing in. See **Pressing needle roller bearing into clutch housing**
3. **Reverse gear wheel**
4. **Circlip**
   - Always replace
5. **Reverse sliding gear wheel**
   - Before replacing remove circlip
   - Shoulder faces to reverse gear wheel
6. **Reverse shaft**
   - Removing. See **Assembly sequence**
7. **Needle roller bearing**
   - Pressing out. See **Pressing needle roller bearing out of reverse shaft support**
   - Pressing in. See **Pressing needle roller bearing into reverse shaft support**
8. **Reverse shaft support**
   - Removing and installing. See **Assembly sequence**

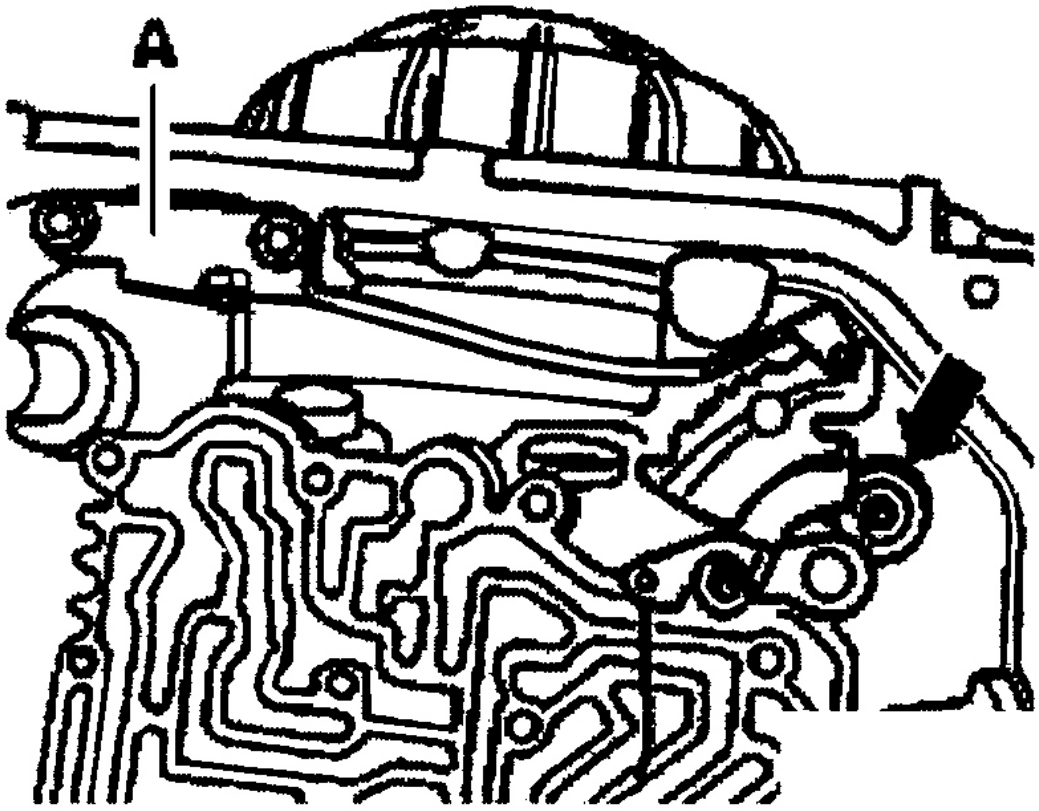

Fig. 147: Dissembled View Of Clutch Housing
Courtesy of VOLKSWAGEN OF AMERICA, INC.

Pulling needle roller bearing out of clutch housing

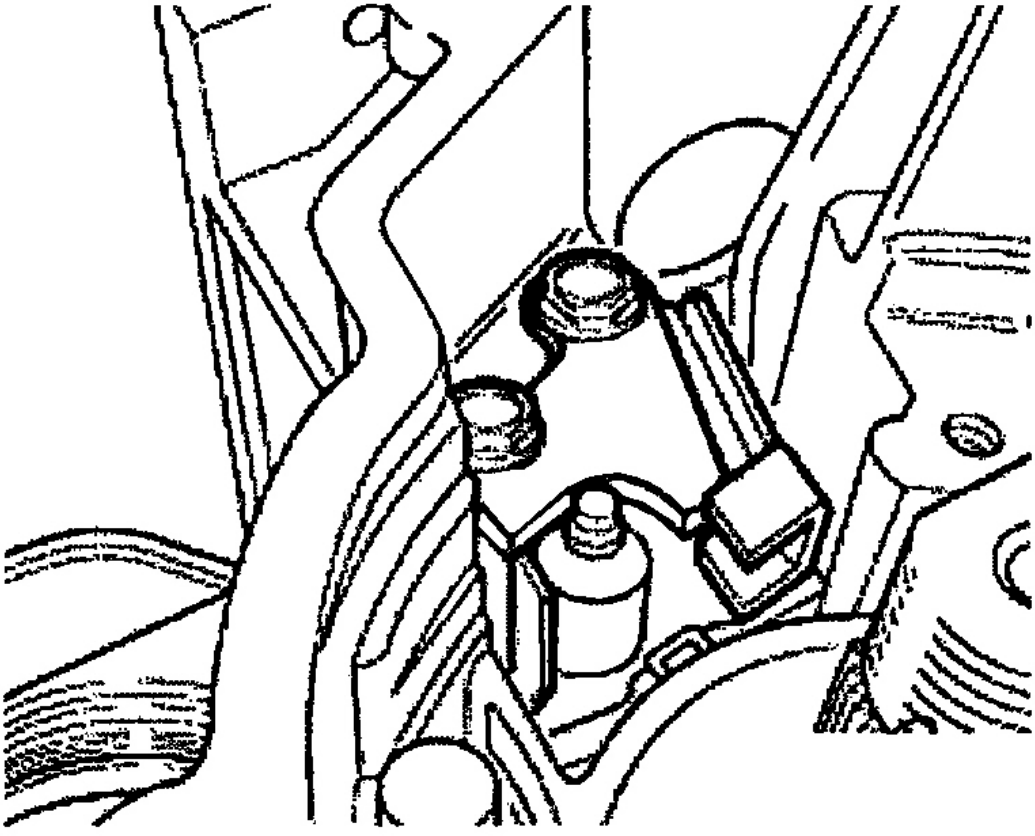

Fig. 148: Pulling Needle Roller Bearing Out Of Clutch Housing
Courtesy of VOLKSWAGEN OF AMERICA, INC.

A. Counter support, e.g. Kukko 22/1
B. Internal extractor 14.5 ... 18.5 mm, e.g. Kukko 21/2

NOTE: The needle bearing is destroyed during removal and must be replaced.

Pressing needle roller bearing into clutch housing

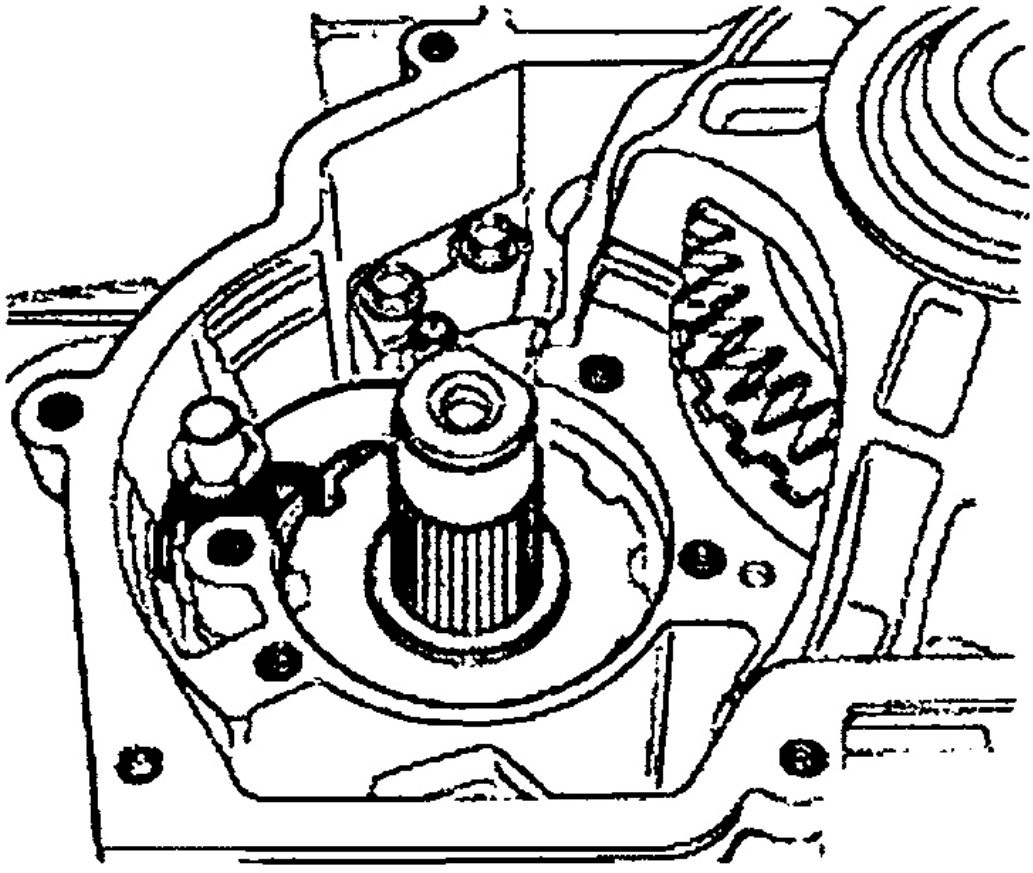

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Fig. 149: Pressing Needle Roller Bearing Into Clutch Housing
Courtesy of VOLKSWAGEN OF AMERICA, INC.

Pressing needle roller bearing out of reverse shaft support

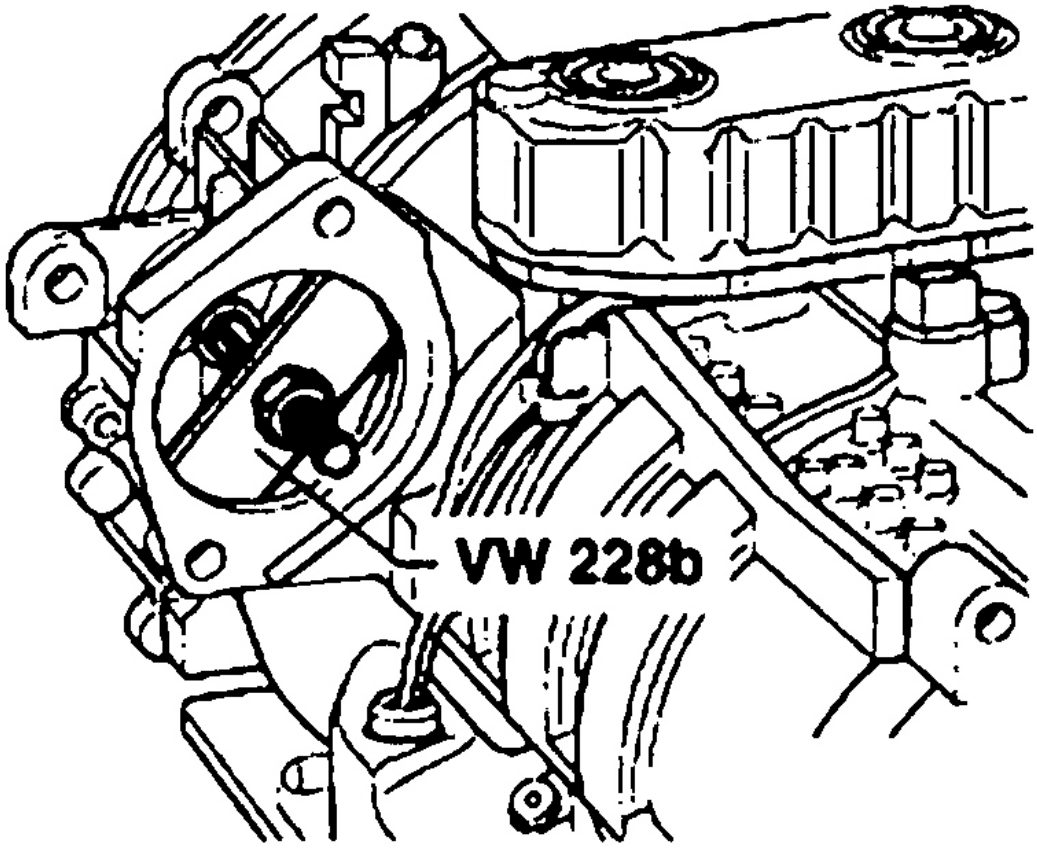

Fig. 150: Pressing Needle Roller Bearing Out Of Reverse Shaft Support
Courtesy of VOLKSWAGEN OF AMERICA, INC.

Pressing needle roller bearing into reverse shaft support

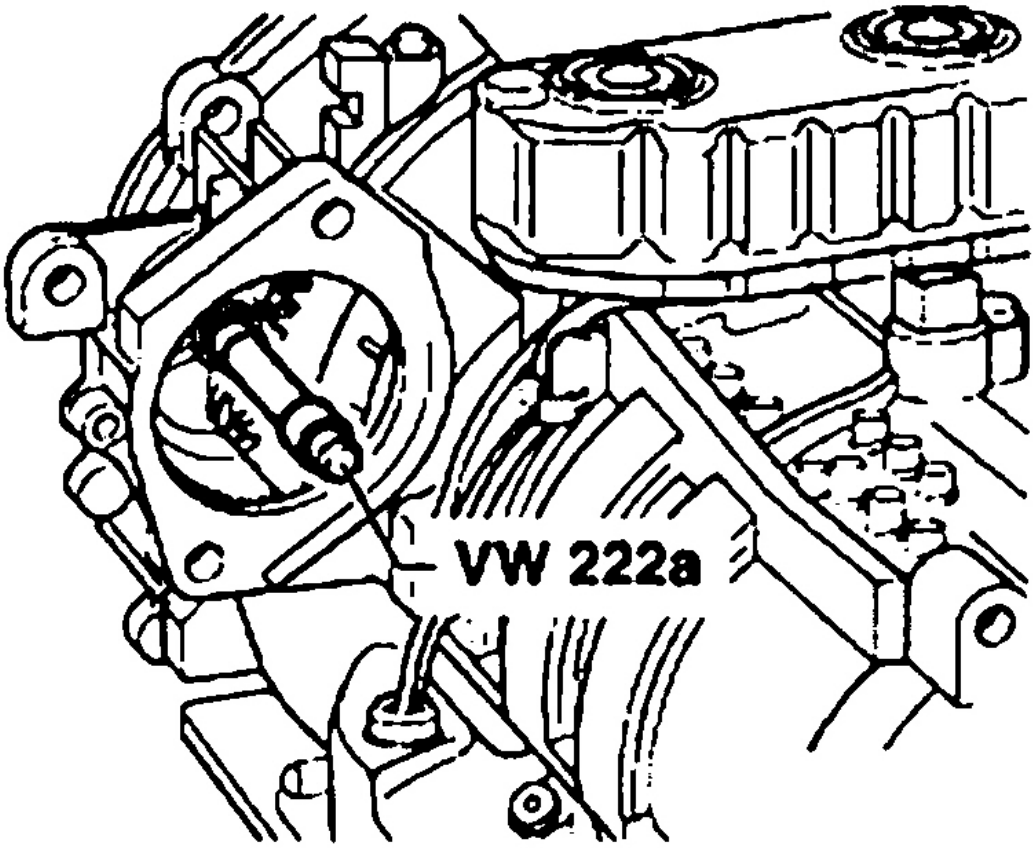

Fig. 151: Pressing Needle Roller Bearing Into Reverse Shaft Support
Courtesy of VOLKSWAGEN OF AMERICA, INC.

FINAL DRIVE, DIFFERENTIAL

FLANGE SHAFT OIL SEALS (TRANSMISSION INSTALLED), REPLACING

Left flange shaft oil seal, removing

Special tools and equipment

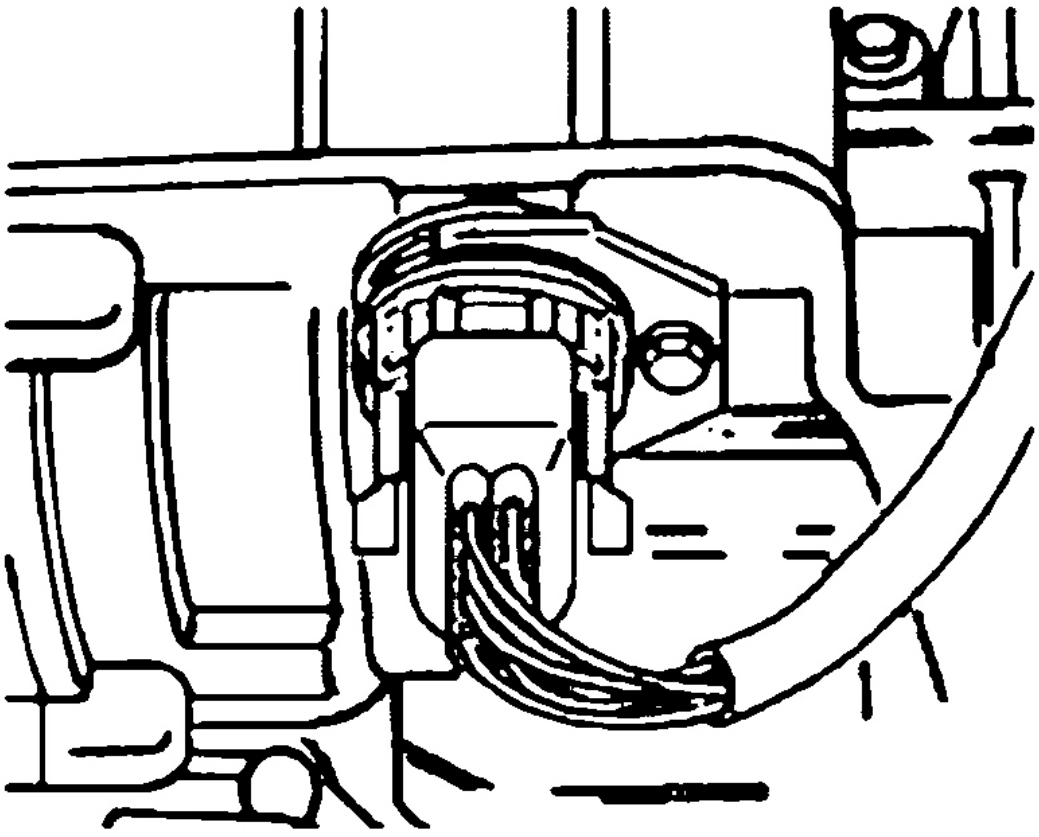

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Fig. 152: Identifying Special Tools And Equipment
Courtesy of VOLKSWAGEN OF AMERICA, INC.

- VW 771 Multipurpose tool
- VW 771/37 Puller hooks
- 3106 Drift
- V.A.G 1331 Torque wrench
- V.A.G 1332 Torque wrench

Removing

- Remove center and left noise insulation tray under engine/transmission if installed.
- Remove drive shaft

  See **FRONT AXLE SHAFT**

- Remove flange shaft securing bolts by screwing two bolts into flange and counterhold flange shaft using a lever.
- Place container under transmission.
- Remove flange shaft with spring.
- Pull out seal for flange shaft with VW 771 and VW 771/37.

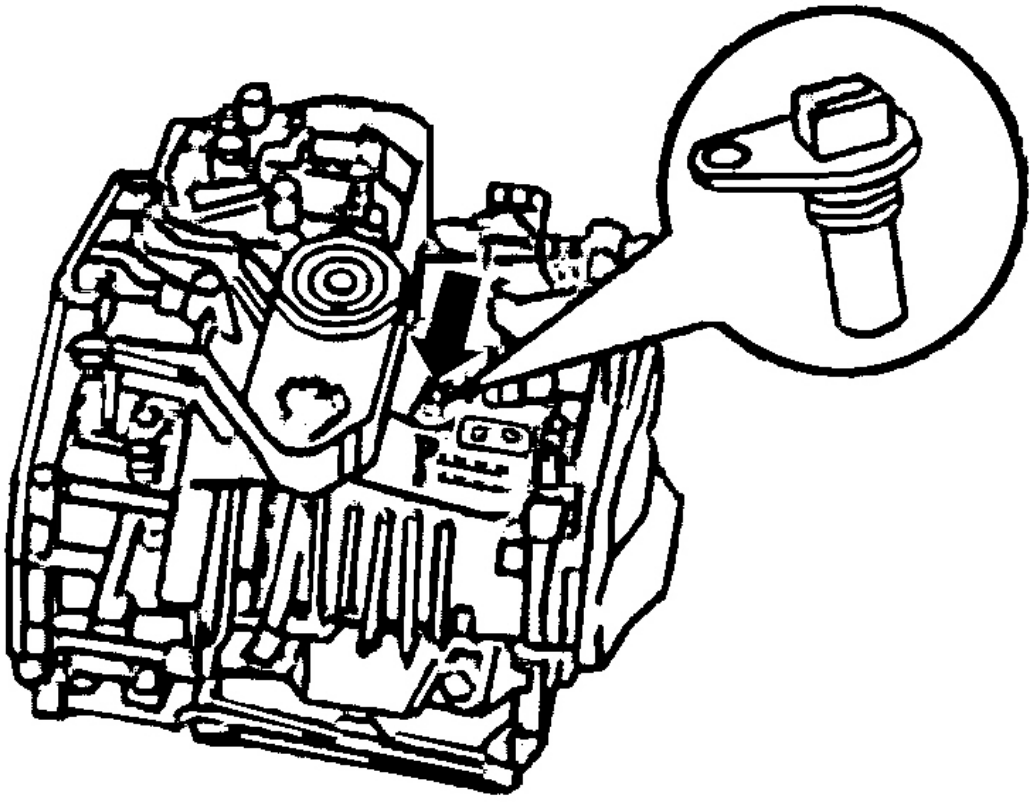

Fig. 153: Removing Left Oil Seal For Flange Shaft
Courtesy of VOLKSWAGEN OF AMERICA, INC.

NOTE:

- **Do not damage sleeve, otherwise leaks will occur.**
- **Replace sleeve if damaged. See Pulling sleeve in .**

Installing

- Drive new seal into sleeve onto stop, when doing this do not cant seal.

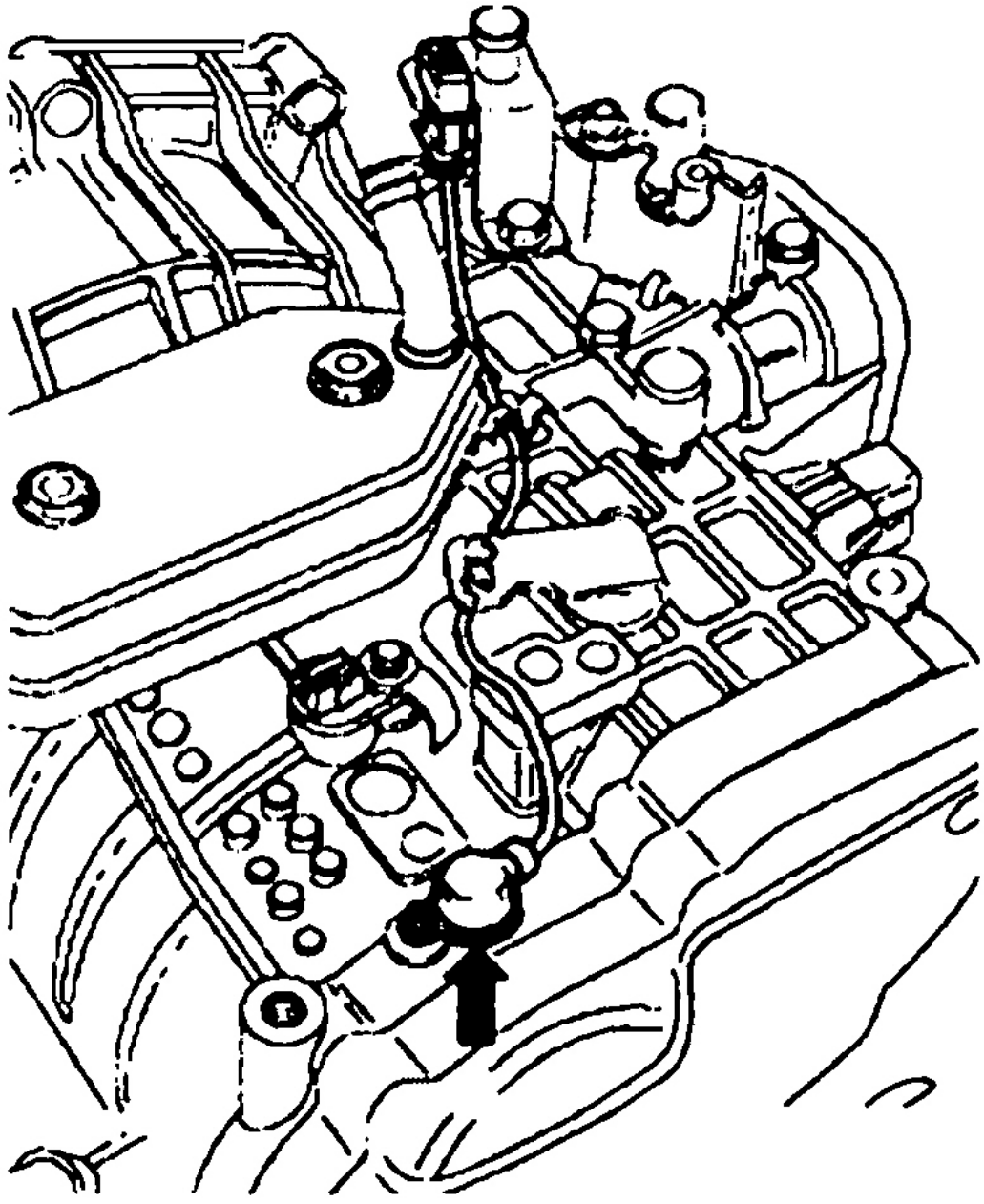

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Fig. 154: Installing Left Oil Seal Into Sleeve Onto Stop
Courtesy of VOLKSWAGEN OF AMERICA, INC.

- Fill space between sealing lip and dust lip with sealing grease G052 128 A1.

- Insert flange shaft.
- Install flange shaft with cone head bolt and tighten to prescribed torque. See **REMOVING** , item 18
- Install drive shafts to transmission.

  See **FRONT AXLE SHAFT** .

- Top off transmission oil. See **CHECKING FLUID LEVEL** .
- Install sound insulation trays.

Right flange shaft oil seal, removing

Special tools and equipment

Seal and sleeve are driven out in two pieces

- 3106 Drift
- 3253/2 Assembly tool
- V.A.G1331 Torque wrench

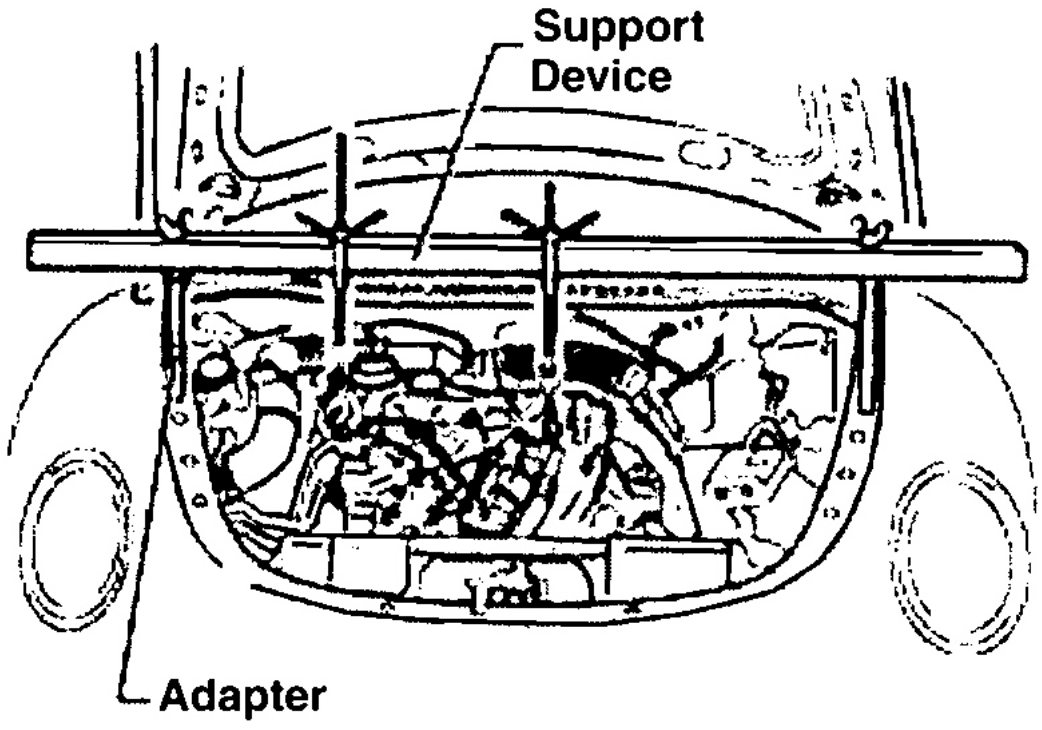


Fig. 155: Identifying Special Tools And Equipment (1 Of 2)
Courtesy of VOLKSWAGEN OF AMERICA, INC.

- T10148 Press piece
- 3066 Assembly device
- VW 771 Multipurpose tool
- VW 771/37 Puller hooks
- V.A.G1331 Torque wrench

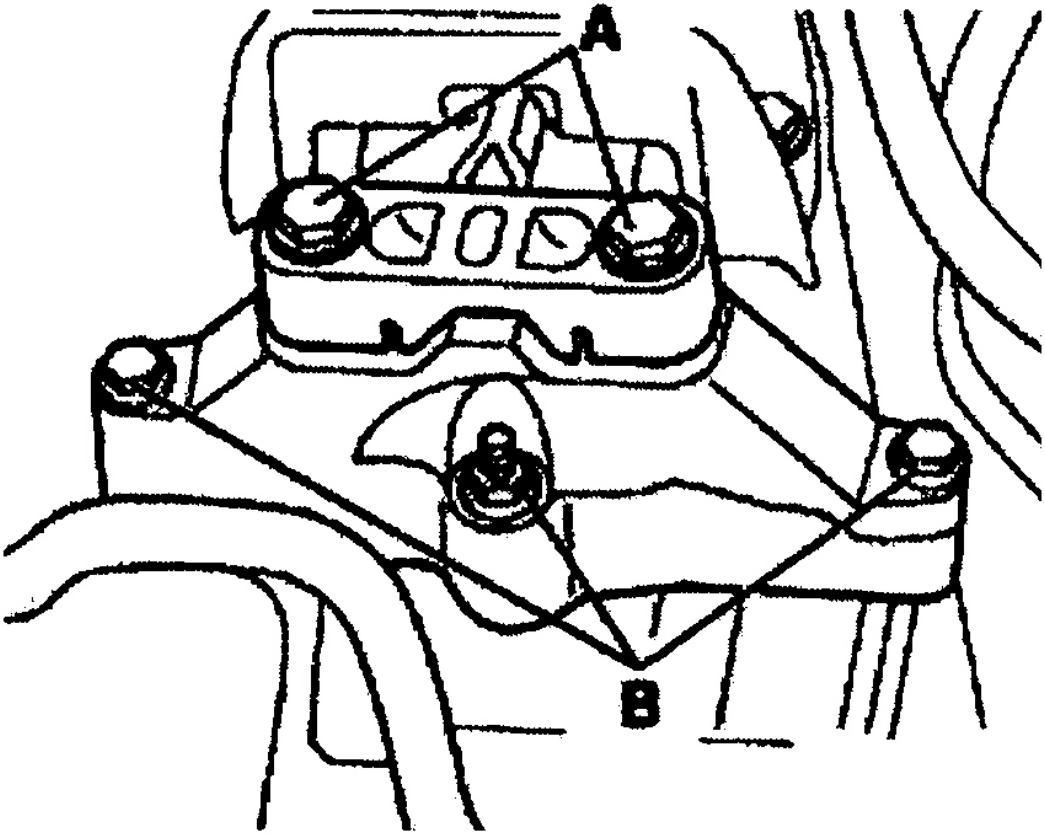


Fig. 156: Identifying Special Tools And Equipment (2 Of 2)
Courtesy of VOLKSWAGEN OF AMERICA, INC.

Removing

- Remove center and left noise insulation tray under engine/transmission if installed.
- Turn steering to right onto full lock stop
- Remove drive shaft protective cover from engine if installed
- Disconnect drive shaft -1- from flange shaft.

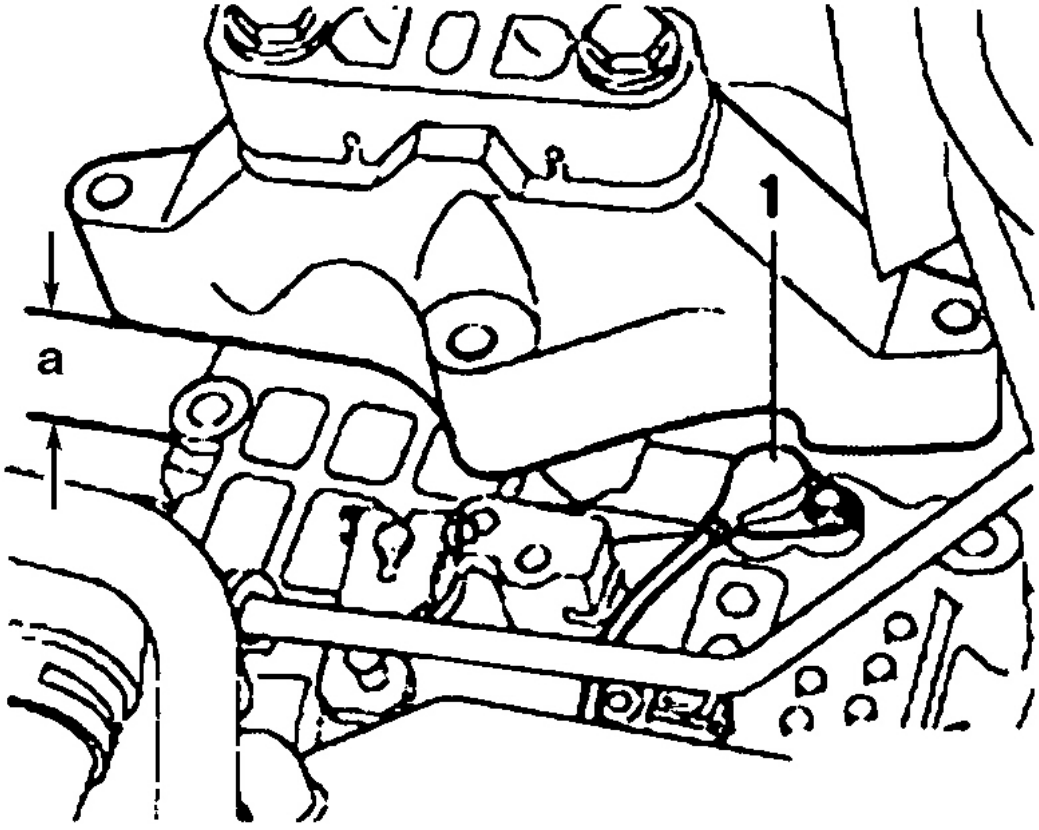


Fig. 157: Disconnecting Right Drive Shaft From Right Flange Shaft
Courtesy of VOLKSWAGEN OF AMERICA, INC.

- Tie-up drive shaft as high as possible. Do not damage paint on drive shaft.
- Place container under transmission and engine.
- Disconnect oil return line for turbocharger from engine, if installed (arrow).

  See CHARGE AIR SYSTEM WITH TURBOCHARGER, TURBOCHARGER WITH ATTACHMENTS, REMOVING AND INSTALLING

- Remove flange shaft securing bolts by screwing two bolts into flange and counterhold flange shaft using a lever.
- Remove flange shaft with spring.

Seal and sleeve are driven out in two pieces:

Pry seal with a screw driver -A-. To do this, support the screw driver on the assembly tool 3253/2.

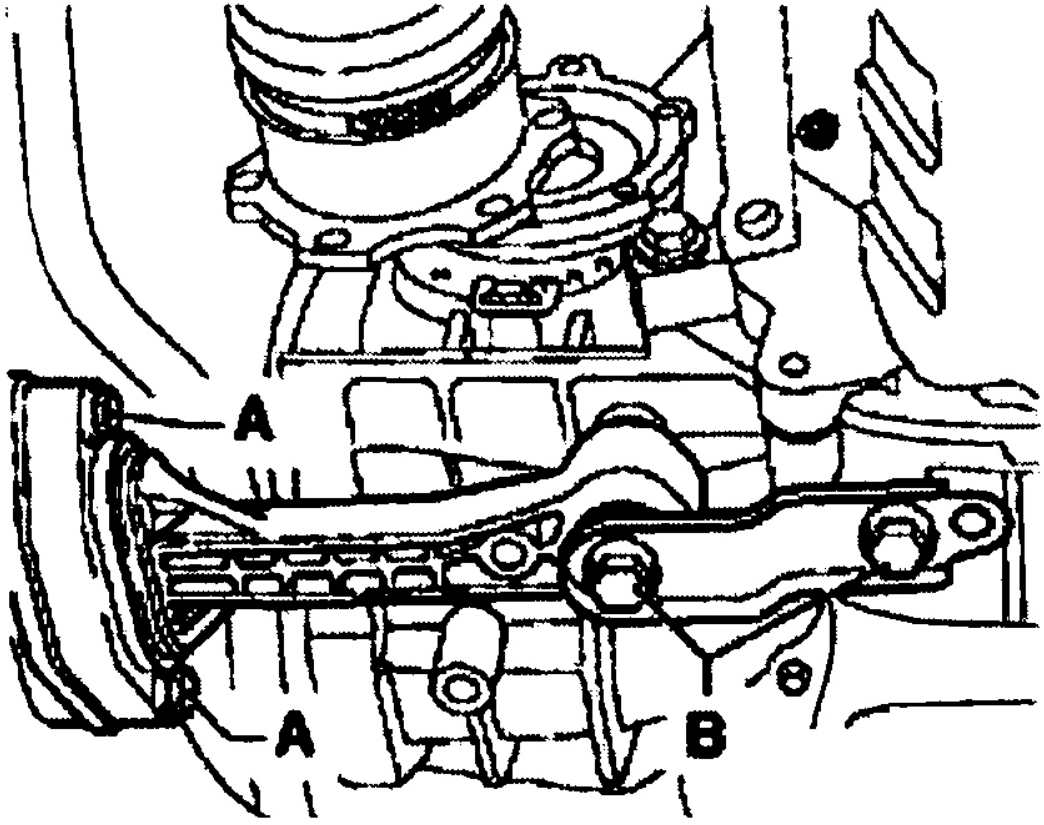


Fig. 158: Removing Right Flange Shaft Oil Seal
Courtesy of VOLKSWAGEN OF AMERICA, INC.

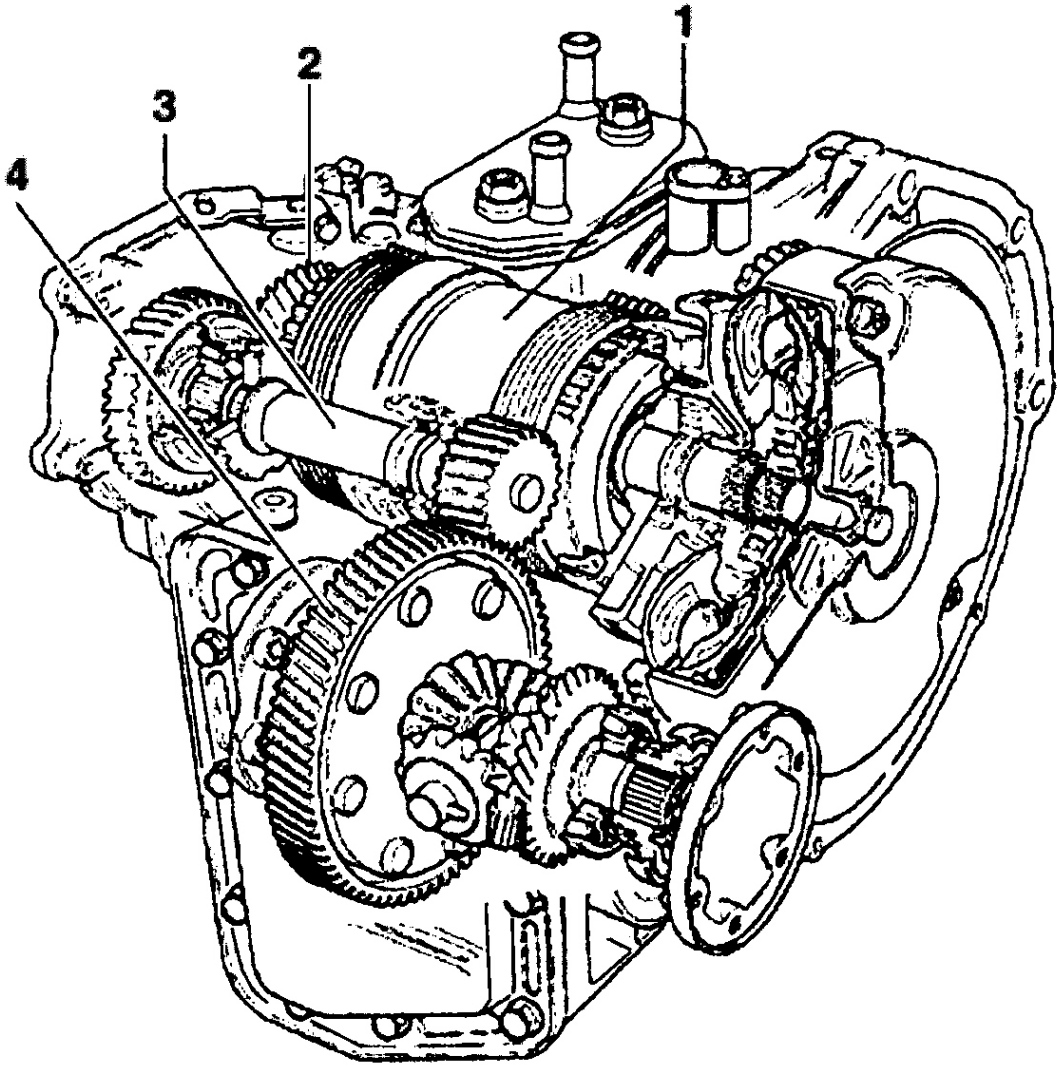
NOTE:

- **Do not damage sleeve, otherwise leaks will occur.**
- **Replace sleeve if damaged. See Pulling sleeve in .**

Seal and sleeve are driven out in one piece:

- Pull out seal and sleeve at the same time.

The inner diameter of the sleeve has a pad.



Final drive, disassembling and assembling

Repair overview of final drive

1 - Planetary gear

2 - Input gear

- Repairs on the input gear can only be performed once the individual components of the transmission have been removed.

3 - Drive pinion

4 - Differential

Fig. 159: Removing Right Flange Shaft Oil Seal And Sleeve
Courtesy of VOLKSWAGEN OF AMERICA, INC.

- Install the puller hook VW 771/37 directly behind the pad in the sleeve.
- Use force to press the puller hook VW 771/37 in the sleeve during the driving out sequence.

Installing

Seal and sleeve are driven out in two pieces:

- Do not bend seal when driving new seal into sleeve onto stop.

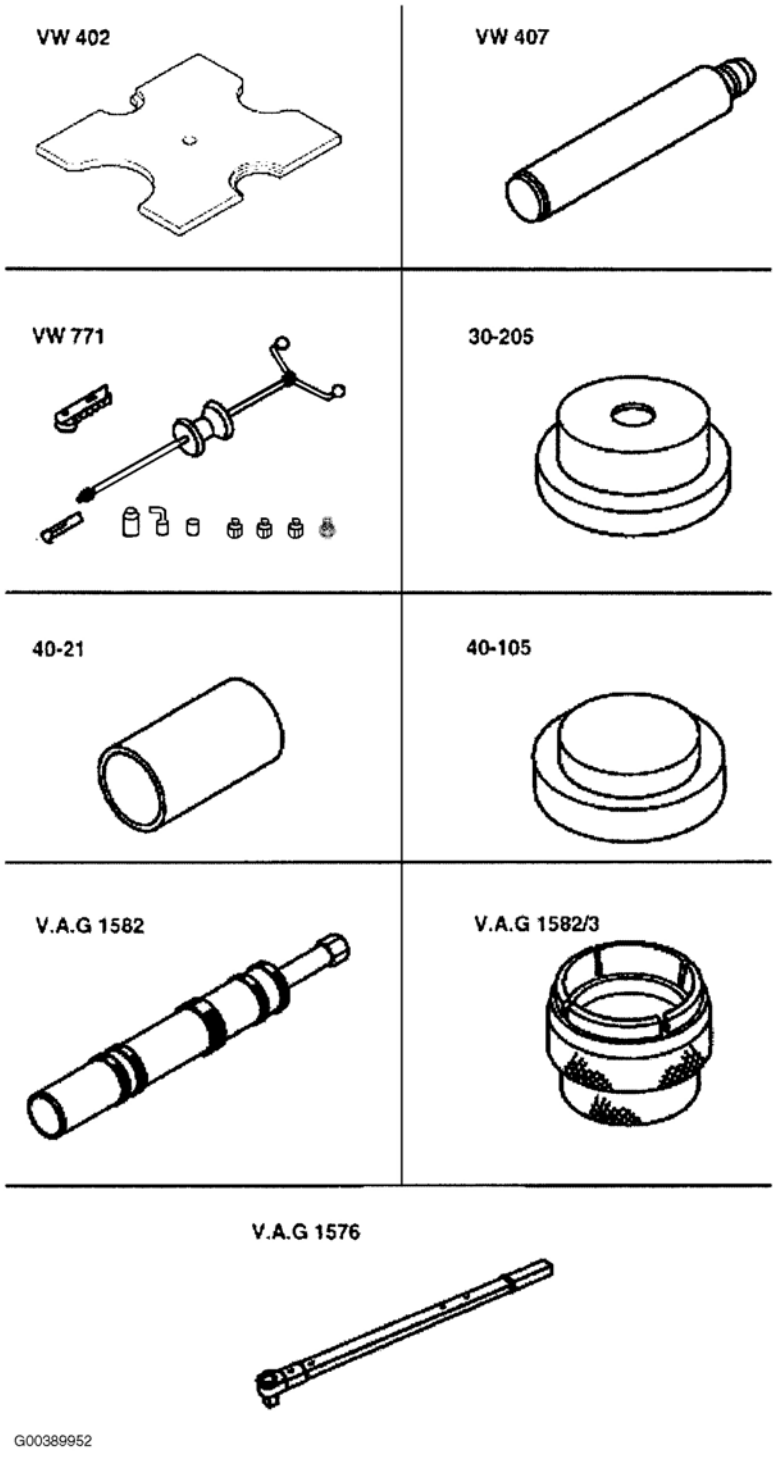
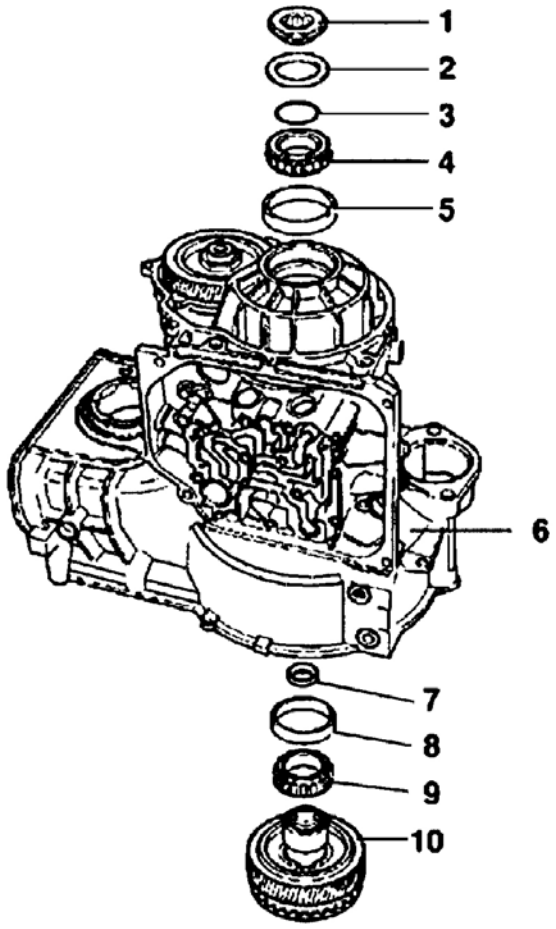


Fig. 160: Installing Right Seal And Sleeve Into Flange Shaft (Seal And Sleeve Are Driven Out In Two Pieces)
Courtesy of VOLKSWAGEN OF AMERICA, INC.

- Fill space between sealing lip and dust lip with sealing grease G052 128 A1.
- Insert flange shaft.

Seal and sleeve are driven out in one piece:

- Clean the sitting place of seal in transmission.
- Pull seal and sleeve together.



Note:

Drive pinion and differential do not need to be removed.

1 - Socket head fastener, 250 Nm
- Engage parking lock to remove and install
- Use 22 mm wrench socket
- Before installing socket head fastener insert axial needle bearing (item - 7 -)

2 - Dished washer
- Curved side faces socket head fastener

3 - Shim

4 - Tapered roller bearing inner race
- After measuring thickness of shim, install onto input gear with locking fluid AMV 185 101 A1

5 - Tapered roller bearing outer race
- Drive out with drift
- Drive in with 30-205
- Insert with locking fluid AMV 185 101 A1

6 - Transmission housing

7 - Axial needle bearing
- Install with flat side facing input gear
- Insert into input gear before installing socket head fastener (item -1-)

8 - Tapered roller bearing outer race
- Drive out with drift
- Drive in with 30-205 and appropriately long drift
- Insert with locking fluid AMV 185 101 A1

9 - Tapered roller bearing inner race
- Insert with locking fluid AMV 185 101 A1

10 - Input gear
- With impulse wheel for vehicle speed sensor -G68-
- If signs of damage exist, always replace input gear and output gear together
- If input gear is replaced, adjust planet carrier

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Fig. 161: Installing Right Seal And Sleeve Into Flange Shaft (Seal And Sleeve Are Driven Out In One Piece)
Courtesy of VOLKSWAGEN OF AMERICA, INC.

A. Turn the spindle from the assembly device 3066 in the threaded piece from the differential.
B. Nut M12

- Pull in seal with sleeve using press piece T10148 onto stop by turning the nut -B-.
- Fill space between sealing lip and dust lip with sealing grease G052 128 A1.
- Insert flange shaft.

Continued for all vehicles

- Install flange shaft with cone head bolt and tighten to prescribed torque. See **REMOVING** , item 18.
- Disconnect oil return line for turbocharger from engine, if installed (arrow).

  See CHARGE AIR SYSTEM WITH TURBOCHARGER, TURBOCHARGER WITH ATTACHMENTS, REMOVING AND INSTALLING

- Connect drive shaft -1- to flange shaft.

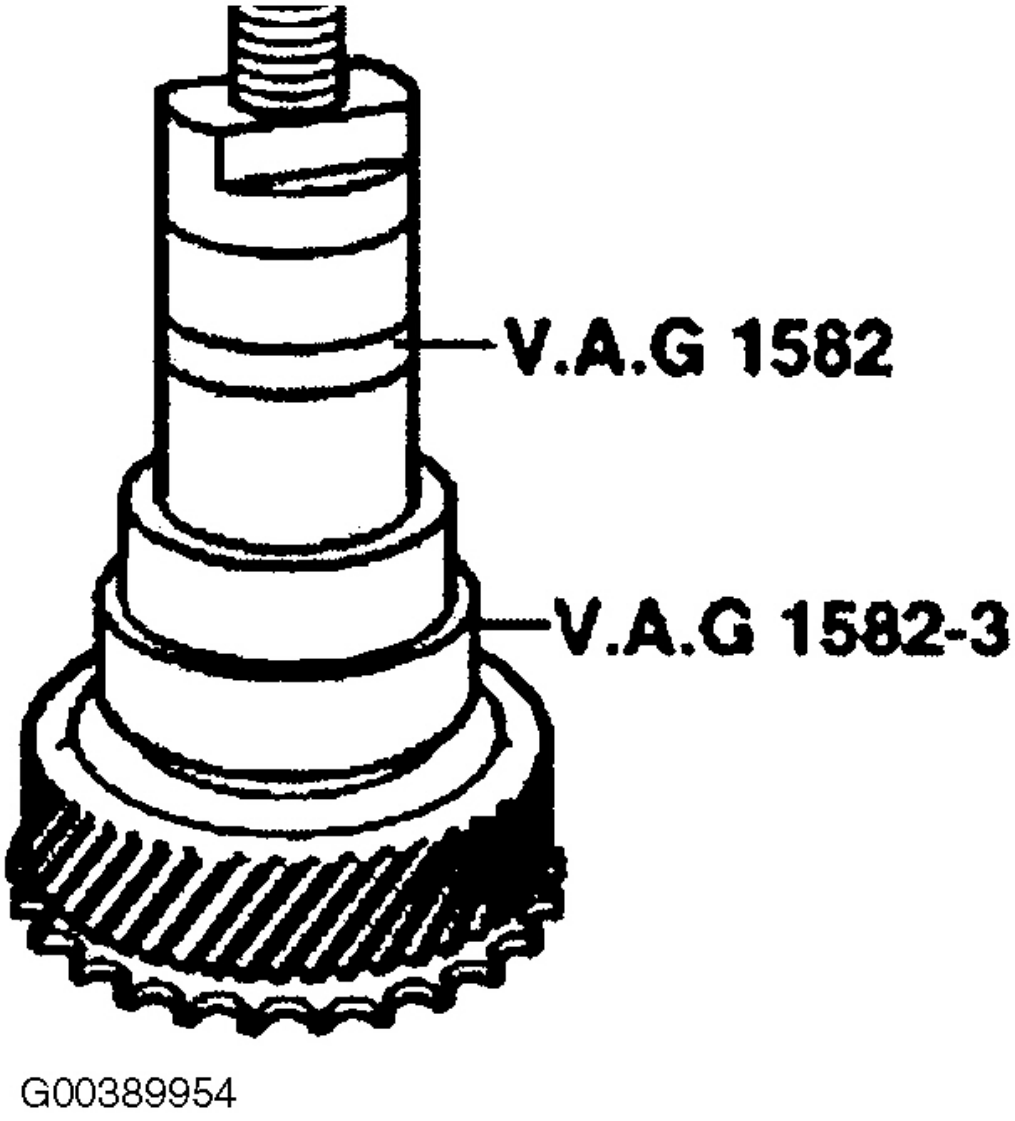

Fig. 162: Disconnecting Oil Return Line For Turbocharger From Engine
Courtesy of VOLKSWAGEN OF AMERICA, INC.

See **FRONT AXLE SHAFT**

- Screw drive shaft protective cover if installed
- Screw protective cover for drive shaft if installed.
- Top off transmission oil. See **CHECKING FLUID LEVEL** .

- Install sound insulation tray.

Tightening torques:

- Flange shaft to transmission (conical head bolt). See **REMOVING** , item 18.
- Protective cover for drive shaft to engine

DIFFERENTIAL, DISASSEMBLING AND ASSEMBLING

Special tools and equipment

- V.A.G 1582 Puller
- V.A.G 1582/3 Grip
- VW 412 Press tool
- 40-105 Thrust plate
- VW 401 Press plate
- VW 402 Press plate

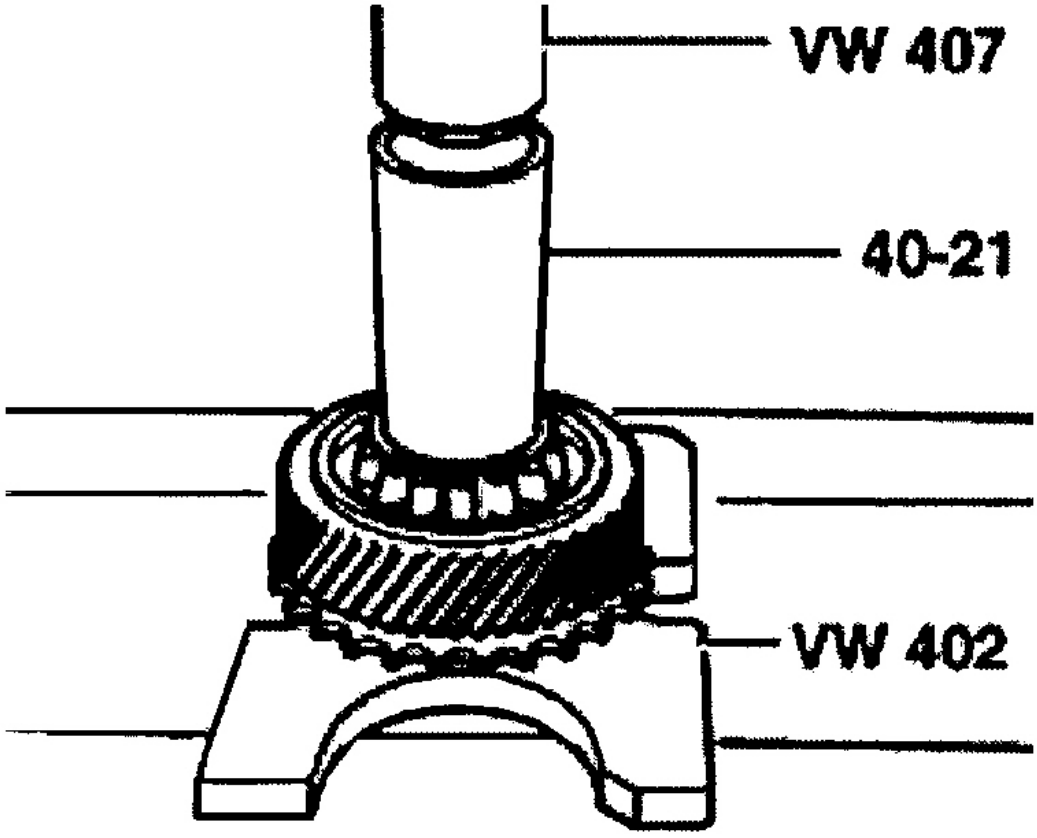

Fig. 163: Identifying Special Tools And Equipment (1 Of 2)
Courtesy of VOLKSWAGEN OF AMERICA, INC.

- VW 408 A Press tool
- VW 473 Thrust piece
- 30-205 Thrust plate
- 3144 Sleeve
- 2007 Thrust pad

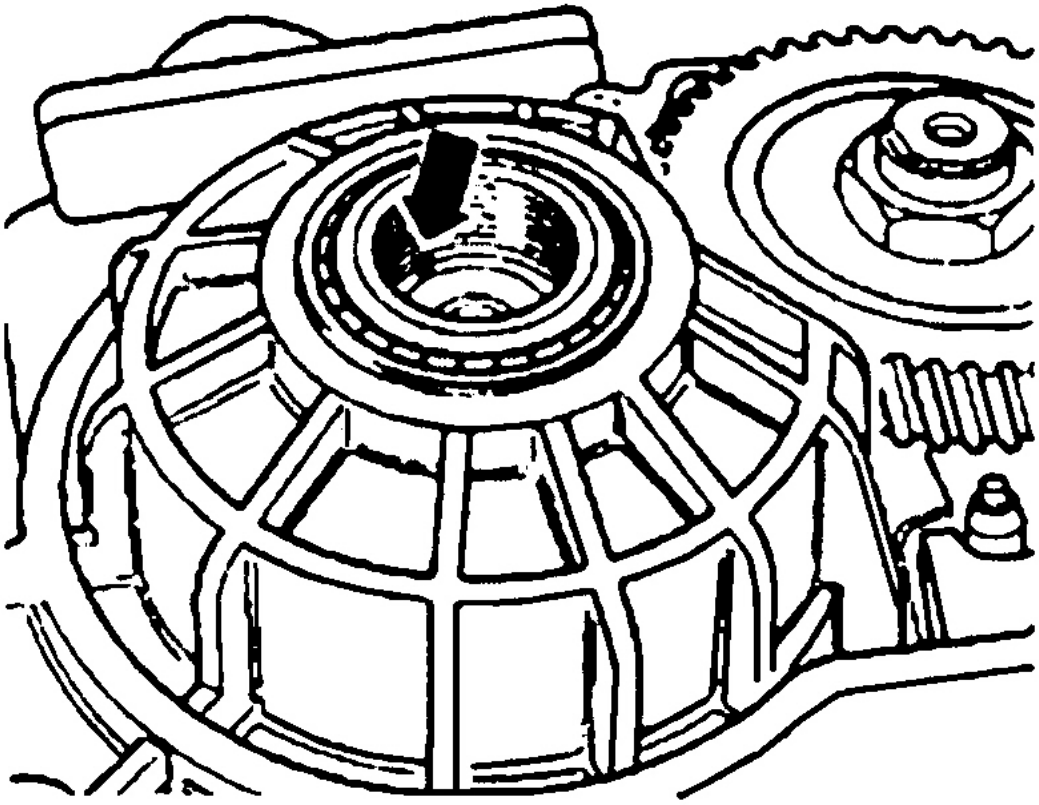

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Fig. 164: Identifying Special Tools And Equipment (2 Of 2)
Courtesy of VOLKSWAGEN OF AMERICA, INC.

NOTE:

- **Heat tapered roller bearing inner race to 100° C before installing.**
- **Always replace both tapered roller bearings together as a set.**
- **Adjust differential if tapered roller bearings, differential housing, transmission housing or clutch housing are being replaced. See DIFFERENTIAL, ADJUSTING .**

NOTE: The following list refers to items in Fig. 165 .

1. **Transmission housing**
2. **Bolt**
3. **Differential cage**

- Bolt to final drive gear

4. **Final drive gear wheel**
   - Riveted in production
   - Is paired with output shaft, only replace as a set
   - Pressing off. See **Pressing off final drive gear**
   - Installation position. See **Installation position of final drive gear wheel**
   - Heat to 100° C before installing
   - Install to differential housing. See **Heating final drive gear wheel to approx. 100° C and installing** .
   - Bolted. See **Bolting final drive gear and differential housing together**
5. **Backing plate**
6. **Nut, 70 N.m 7**
7. **Shim**
   - For differential
   - Determining thickness. See **DIFFERENTIAL, ADJUSTING**
8. **Tapered roller bearing outer race**
   - Pulling out **Pulling tapered roller bearing outer race out of transmission housing**
   - Pressing in. See **Pressing tapered roller bearing outer race into transmission housing**
9. **Tapered roller bearing inner race**
   - Pulling off. See **Pulling off tapered roller bearing inner race**
   - Pressing on **Pressing on tapered roller bearing inner race**
10. **Differential housing**
    - With riveted final drive gear
    - When replacing final drive gear drill out rivet heads. See **Drilling out rivet heads**
    - Attaching final drive gear with bolts. See **Bolting final drive gear and differential housing together**
11. **Speedometer drive wheel**
    - Install onto differential housing as far as stop before pressing on inner race
12. **Tapered roller bearing inner race**
    - Pulling off. See **Pulling off tapered roller bearing inner race**
    - Pressing on **Pressing on tapered roller bearing inner race**
13. **Tapered roller bearing outer race**
    - Pressing out. See **Pressing tapered roller bearing outer race out of clutch housing**
    - Pressing in. See **Pressing tapered roller bearing outer race into clutch housing**
14. **Clutch housing**
15. **15-Sleeve**
    - Installed together with springs behind flange shafts
    - To accept oil seal (item 16)

- Removing and installing. See **Pulling sleeve in**

16. **Oil seal**
    - Replacing with transmission installed. See **FLANGE SHAFT OIL SEALS (TRANSMISSION INSTALLED), REPLACING** .
17. **One piece oil seal and sleeve**
    - If seal is damaged, replace oil seal and sleeve together. See **FLANGE SHAFT OIL SEALS (TRANSMISSION INSTALLED), REPLACING** .
18. **Cone head bolt, 25 N.m**
    - Bolt into threaded piece (item 26)
19. **Flange shaft**
    - Removing and installing. See **FLANGE SHAFT OIL SEALS (TRANSMISSION INSTALLED), REPLACING**
20. **Spring for flange shaft**
    - Installed behind flange shafts
21. **Thrust washer**
    - Installation position: Shoulder toward spring, tongue to tapered ring
    - Installation position with changed thrust washer. See **Changed thrust washer for tapered ring** .
22. **Tapered ring**
    - With grooves to secure thrust washer
    - Installation position: Taper toward differential housing
23. **Securing clip**
    - Holds tapered ring, thrust washer and spring in position when drive flange is removed
24. **One-piece thrust washer**
    - Coat with transmission oil when installing
25. **Sun gear**
    - Installing. See **Installing differential side gears and pinion gears**
26. **Threaded piece**
    - Installing. See **Installing differential side gears and pinion gears**
27. **Differential pinion shaft**
    - Knock out with drift
    - Installing. See **Installing differential side gears and pinion gears**
28. **Spring pin**
    - For securing planet pinion axis shaft
    - Removing and installing. See **Removing and installing differential pinion shaft spring pin**
29. **Differential pinion gear**
    - Installing. See **Installing differential side gears and pinion gears**
30. **Differential side gear**
    - Installing. See **Installing differential side gears and pinion gears**

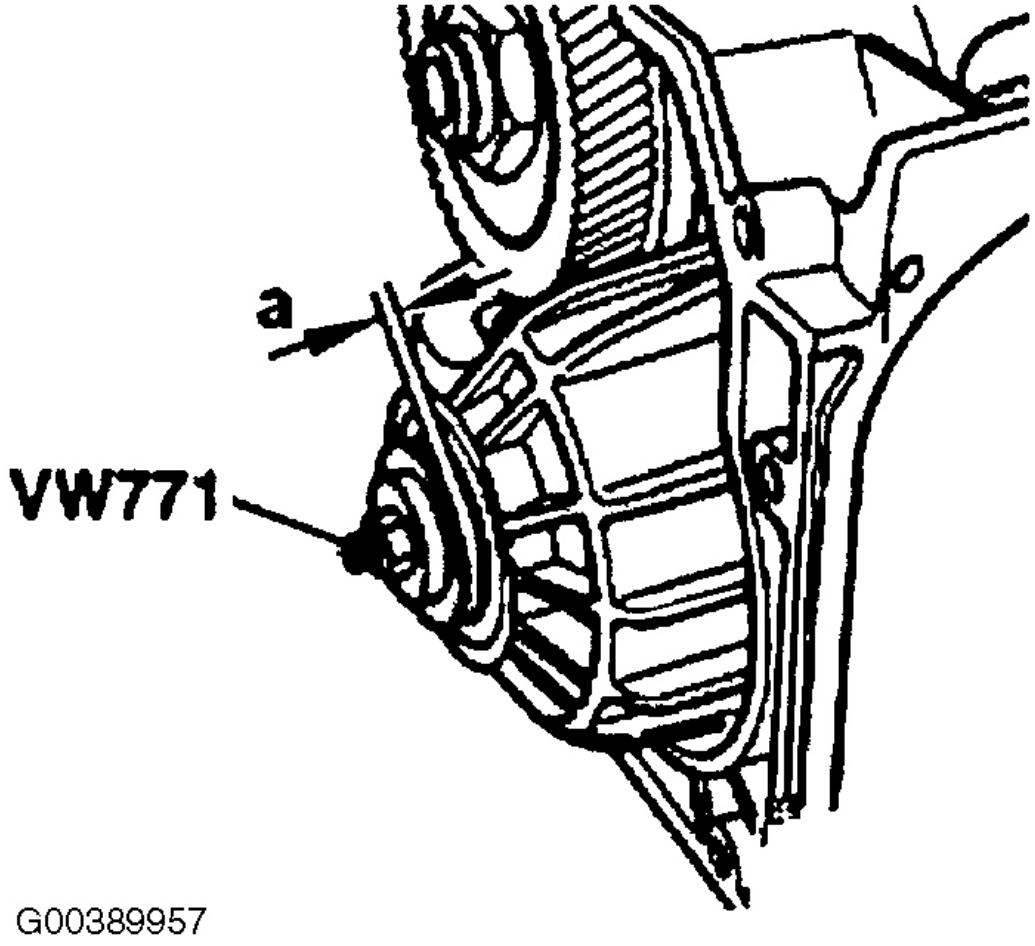


Fig. 165: Exploded View Of Differential Assembly
Courtesy of VOLKSWAGEN OF AMERICA, INC.

Pressing tapered roller bearing outer race out of clutch housing

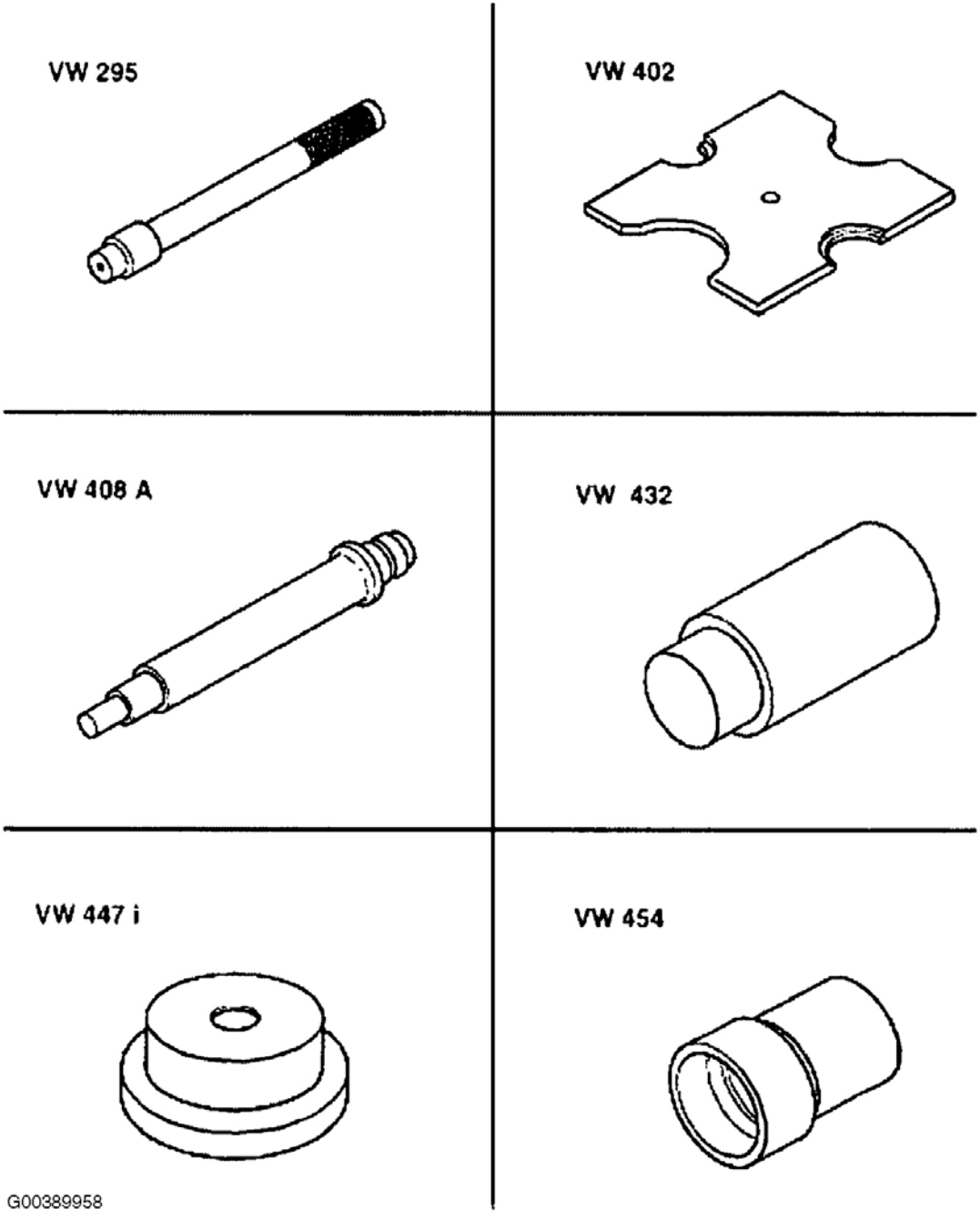


Fig. 166: Pressing Tapered Roller Bearing Outer Race Out Of Clutch Housing
Courtesy of VOLKSWAGEN OF AMERICA, INC.

Pressing tapered roller bearing outer race into clutch housing

- For transmissions with springs behind flange shafts, first remove mounting sleeve for flange shaft seal.

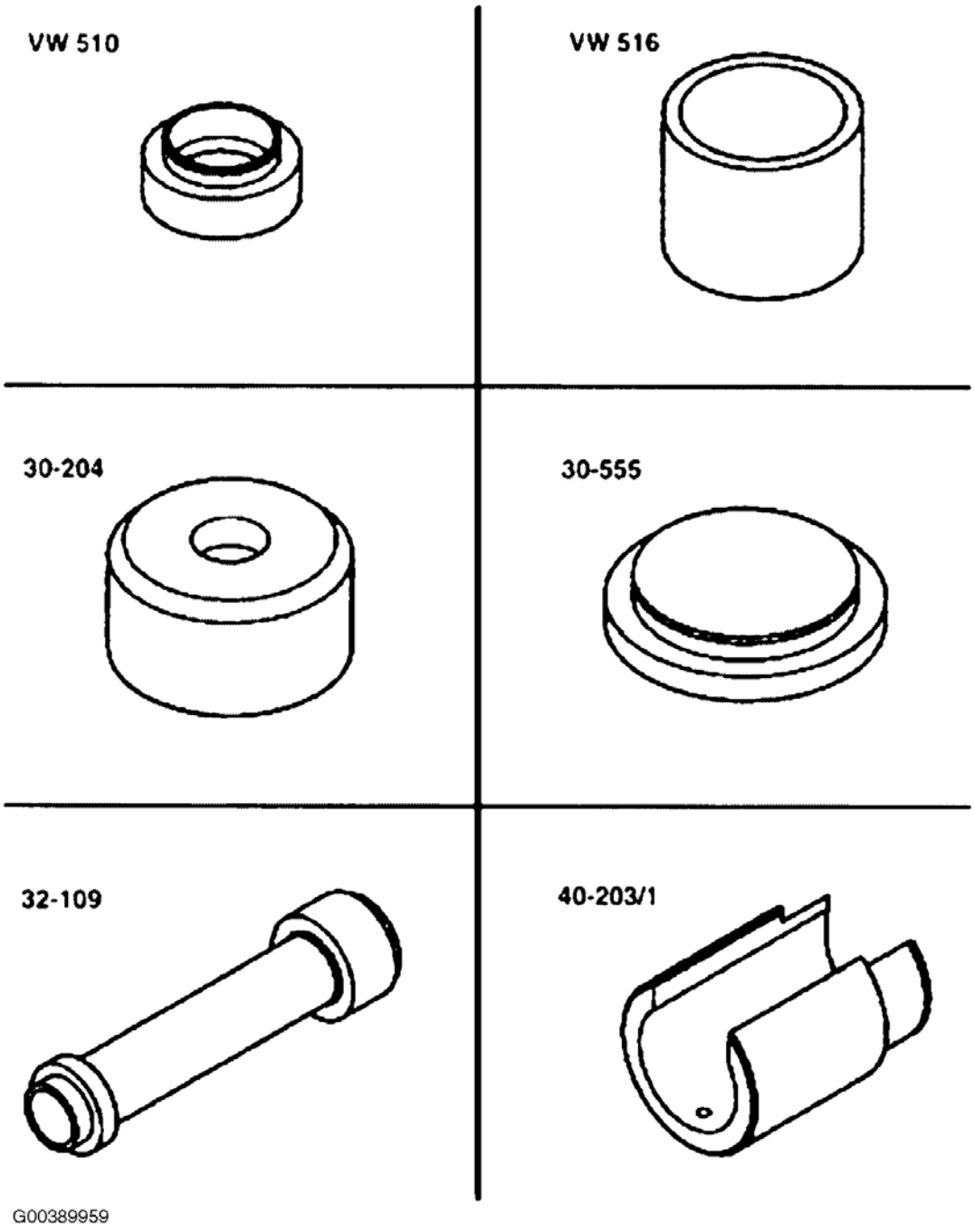


Fig. 167: Pressing Tapered Roller Bearing Outer Race Into Clutch Housing
Courtesy of VOLKSWAGEN OF AMERICA, INC.

No shim is installed in the clutch housing end.

Pulling off tapered roller bearing inner race

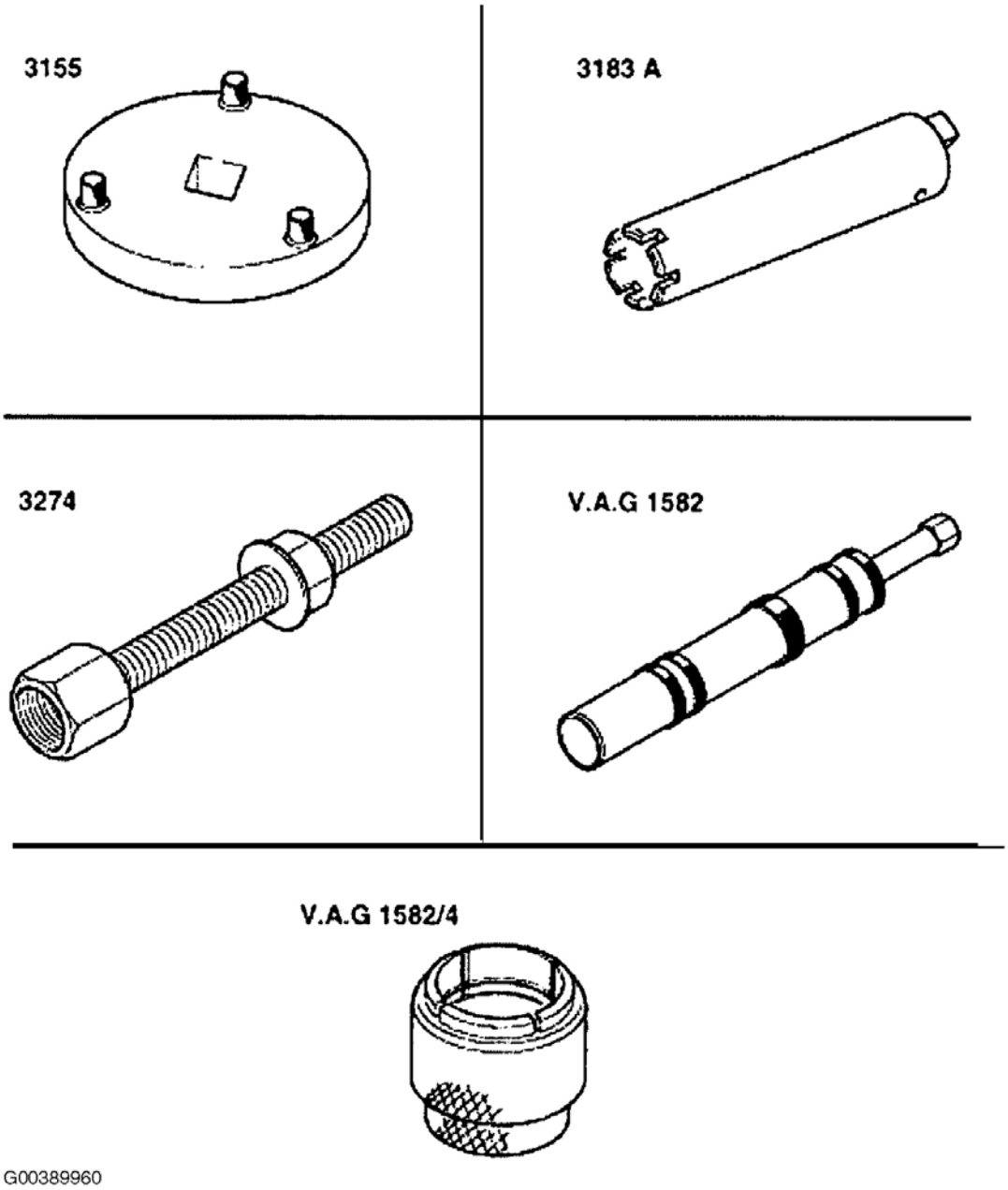
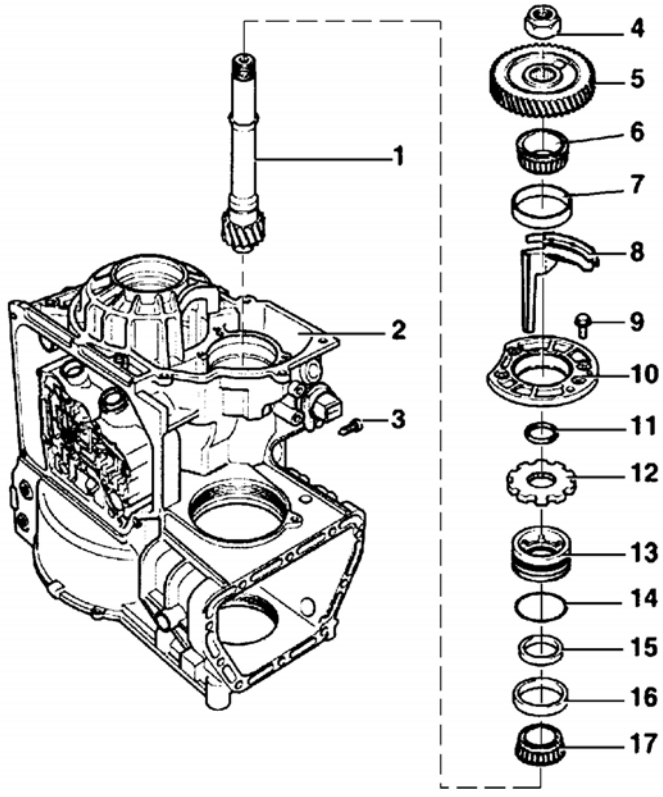


Fig. 168: Pulling Off Tapered Roller Bearing Inner Race
Courtesy of VOLKSWAGEN OF AMERICA, INC.

- Before installing extractor position press piece 40-105 on differential housing.

NOTE: Both tapered roller bearing inner races are pulled off the differential housing in the same way.

Pressing on tapered roller bearing inner race



Note:
To remove the drive pinion, the selector shaft must be removed after taking out the parking lock.

1. Drive Pinion
2. Transmission Housing
3. Screw, 12 Nm
   Remove screw before removing or installing bearing supporting ring -item 13 -.
   Insert with sealing agent AKD 456 000 01
4. Hex Nut, 250 Nm
   Engage parking lock to remove or install
   Secure with drift
5. Output Gear
   If signs of damage exist, always replace input gear and output gear together
6. Tapered Roller Bearing Inner Race
7. Tapered Roller Bearing Outer Race
   Drive out with drift
8. ATF oil deflector
   Install together with bearing cap -item 10 -
9. Bolt, 25 Nm
10. Bearing Cap
11. Shim
12. Parking Lock Gear
    Rounded side faces teeth of drive pinion
13. Bearing Supporting Ring, 200 Nm
    Remove screw -item 3 - before removing or installing bearing supporting ring.
    Bearing supporting ring cannot be unscrewed until selector shaft has been removed
    Insert bearing supporting ring carefully. Sealing lip and spring must not be damaged.
14. O-Ring
    Always replace
    Place onto bearing supporting ring -item 13 -
15. Oil Seal For Drive Pinion
    Remove with screwdriver
16. Tapered Roller Bearing Outer Race
17. Tapered Roller Bearing Inner Race
    Drive off with drift

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Fig. 169: Pressing On Tapered Roller Bearing Inner Race
Courtesy of VOLKSWAGEN OF AMERICA, INC.

NOTE: **The tapered roller bearing inner races for transmission housing and clutch housing are pressed on with the same press tools.**

Pulling tapered roller bearing outer race out of transmission housing

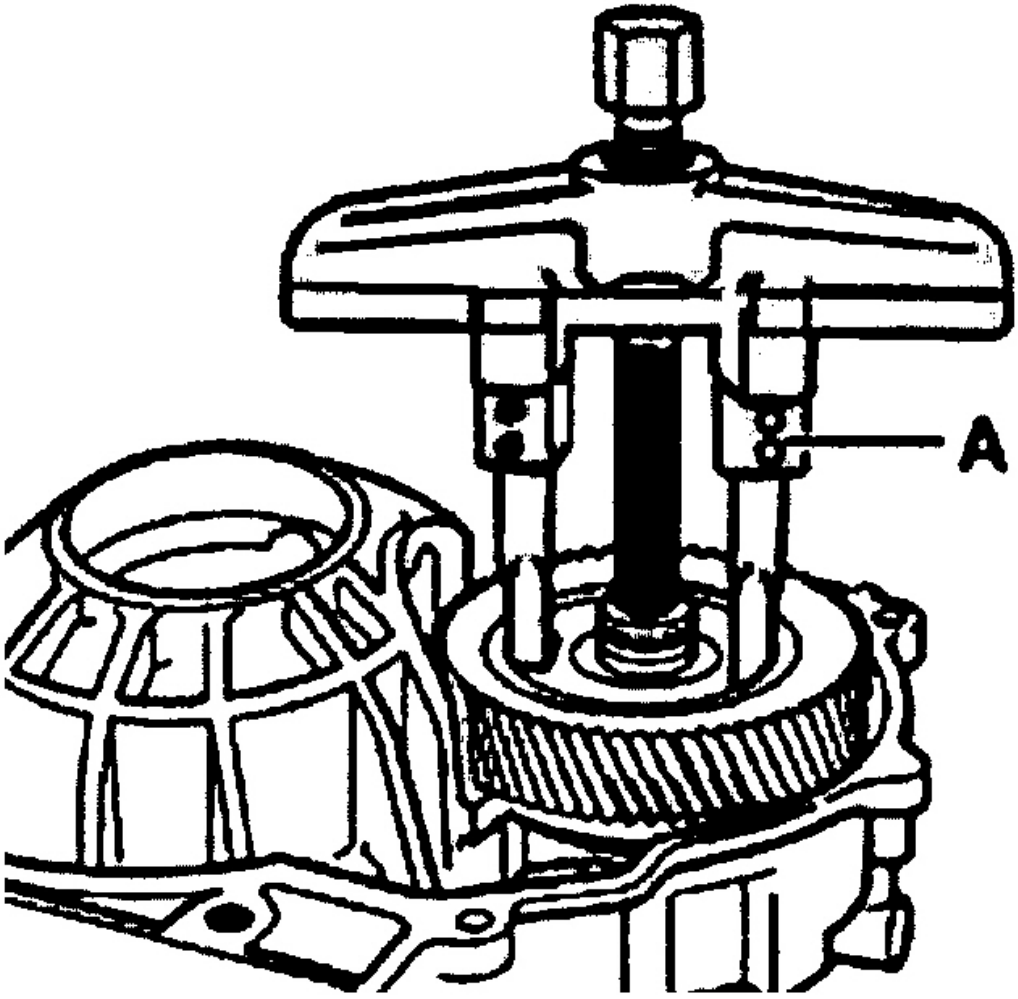

Fig. 170: Pulling Tapered Roller Bearing Outer Race Out Of Transmission Housing
Courtesy of VOLKSWAGEN OF AMERICA, INC.

A. Counter support, e.g. Kukko 22/2
B. Internal puller 46...58 mm, e.g. Kukko 21/7

Pressing tapered roller bearing outer race into transmission housing

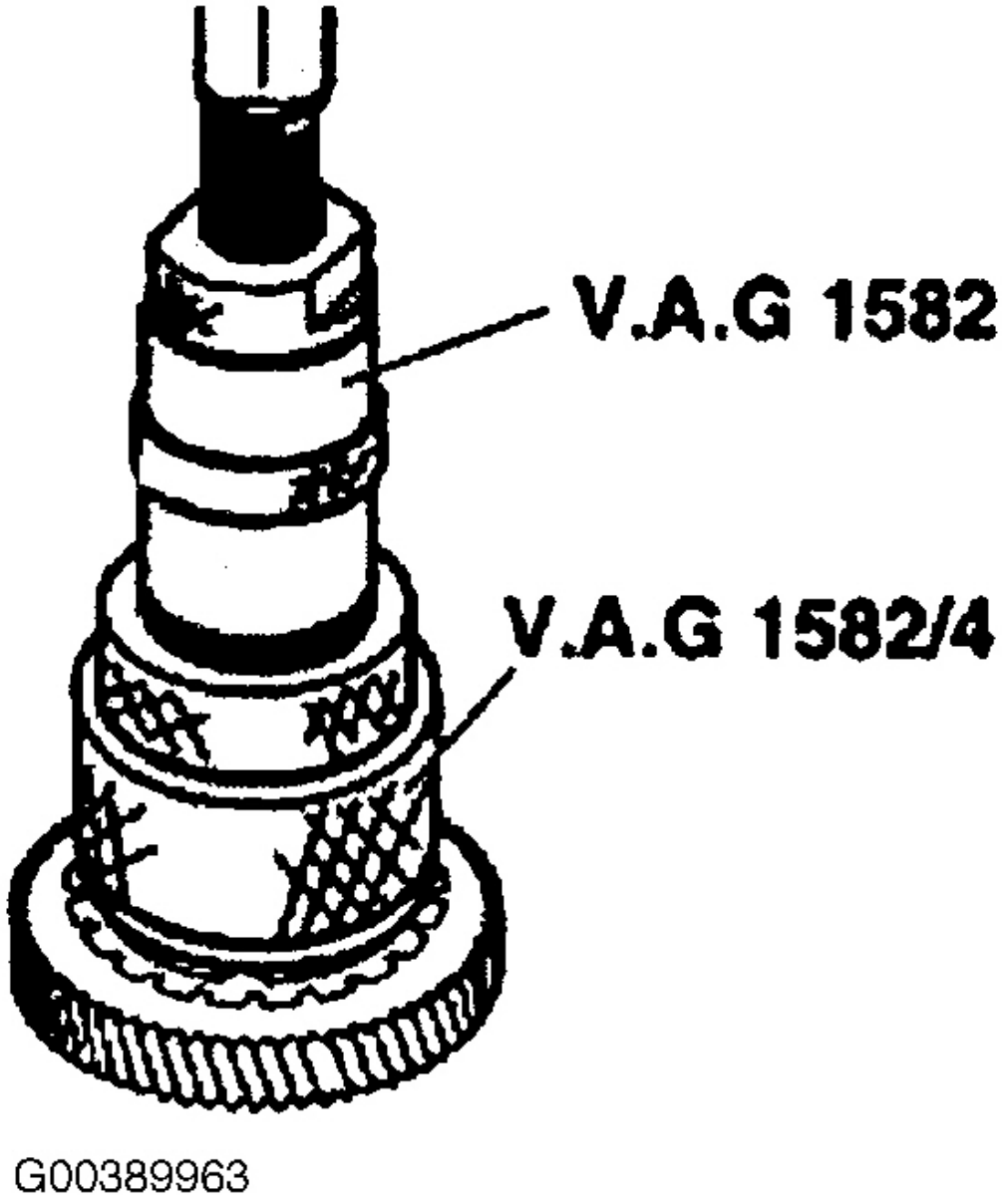

Fig. 171: Pressing Tapered Roller Bearing Outer Race Into Transmission Housing
Courtesy of VOLKSWAGEN OF AMERICA, INC.

- Install shim under outer race.

- Support transmission housing with sleeve 3144 directly below bearing mounting.

Identifying chamfered sides of differential housing

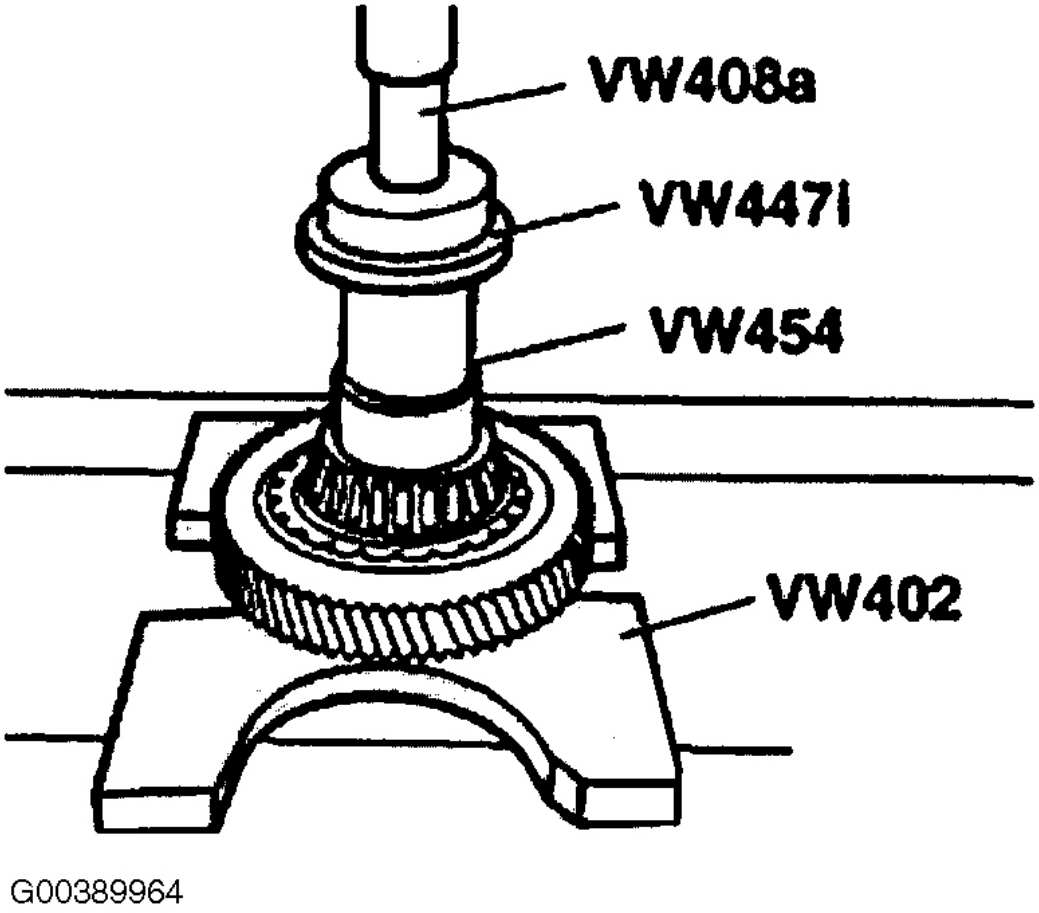

Fig. 172: Identifying Chamfered Sides Of Differential Housing
Courtesy of VOLKSWAGEN OF AMERICA, INC.

Drilling out rivet heads

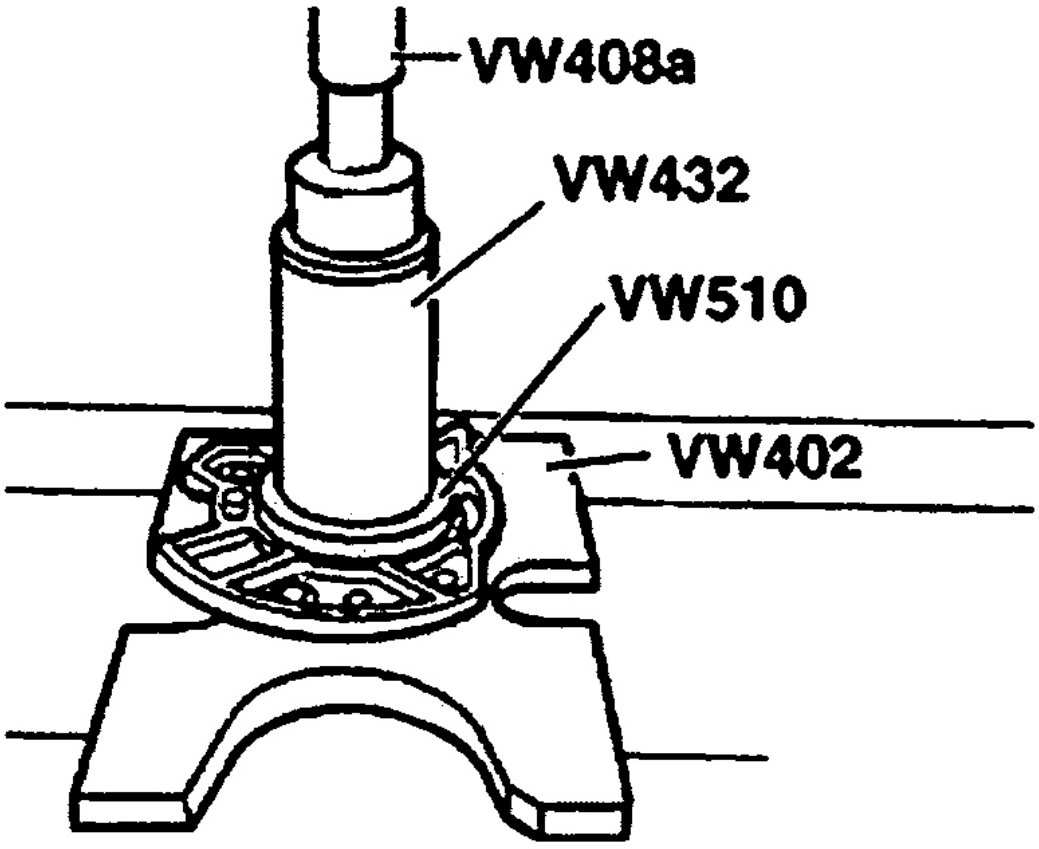

Fig. 173: Drilling Out Rivet Heads
Courtesy of VOLKSWAGEN OF AMERICA, INC.

- Drill out rivet heads with 12 mm drill from countersink side and knock-out with drift.

NOTE: Clean differential before and after drilling, protect tapered roller bearing from drilling.

Pressing off final drive gear

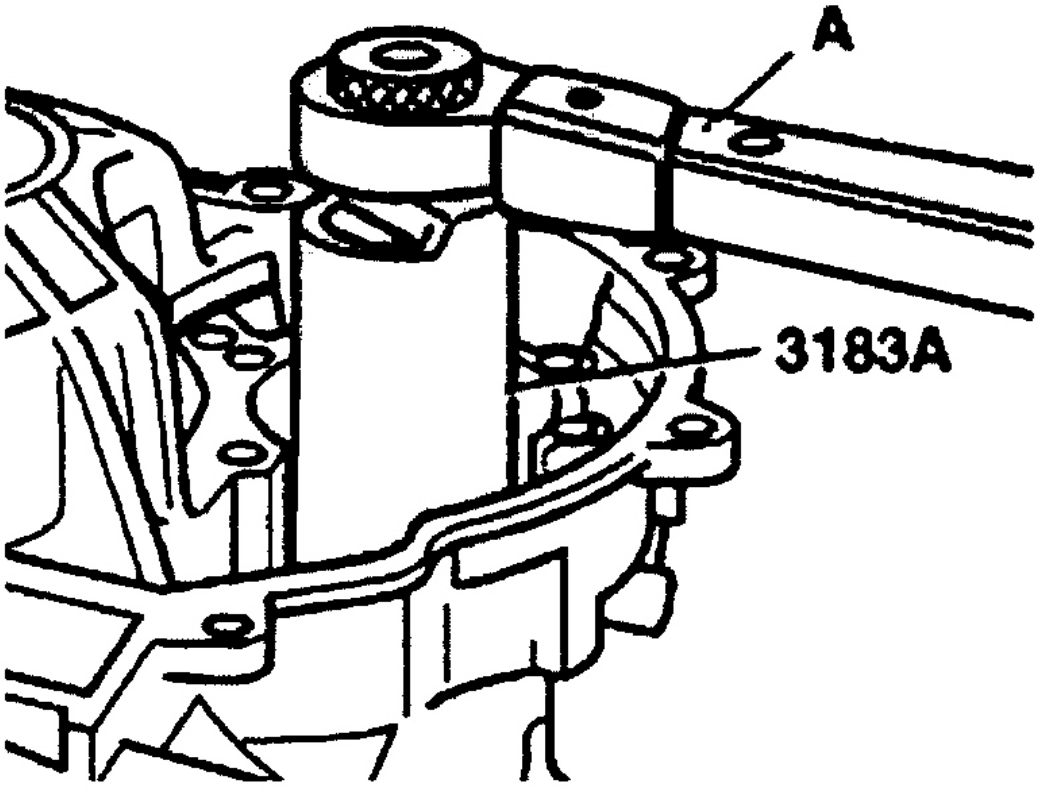

Fig. 174: Pressing Off Final Drive Gear
Courtesy of VOLKSWAGEN OF AMERICA, INC.

- Place thrust piece 40-105 on differential housing.

Installation position of final drive gear wheel

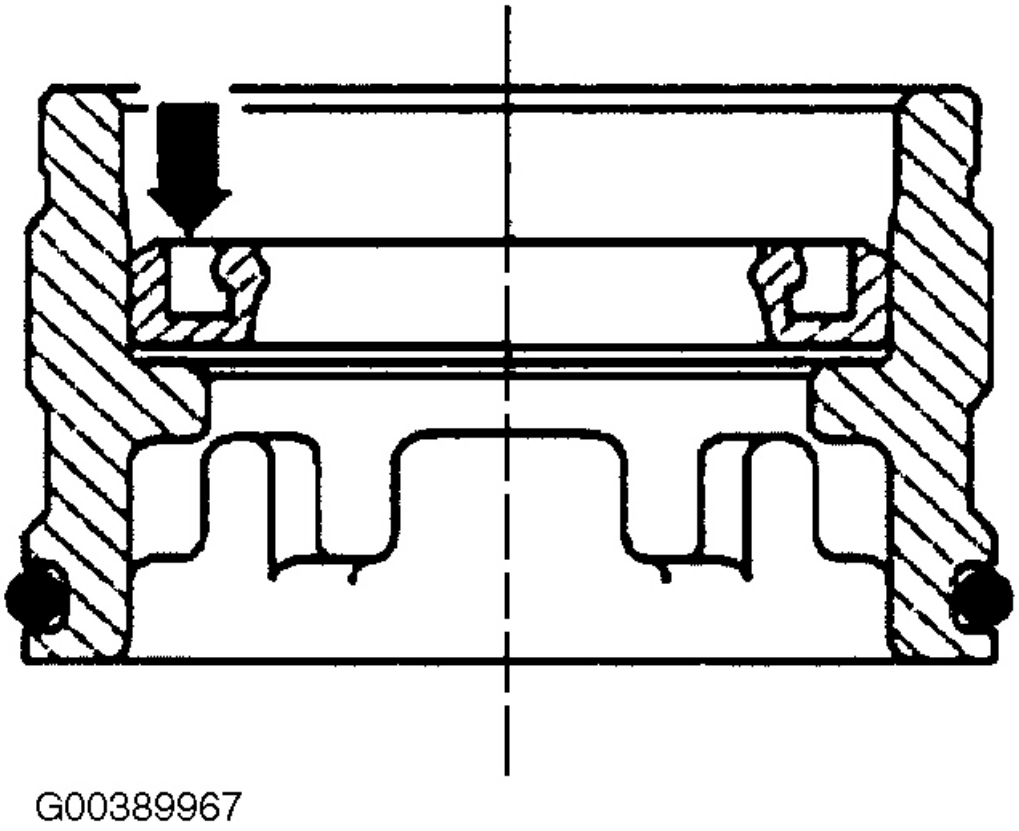

Fig. 175: Identifying Installation Position Of Final Drive Gear Wheel
Courtesy of VOLKSWAGEN OF AMERICA, INC.

The circular groove -A- faces toward bolt-on side of differential.

Heating final drive gear wheel to approx. 100° C and installing

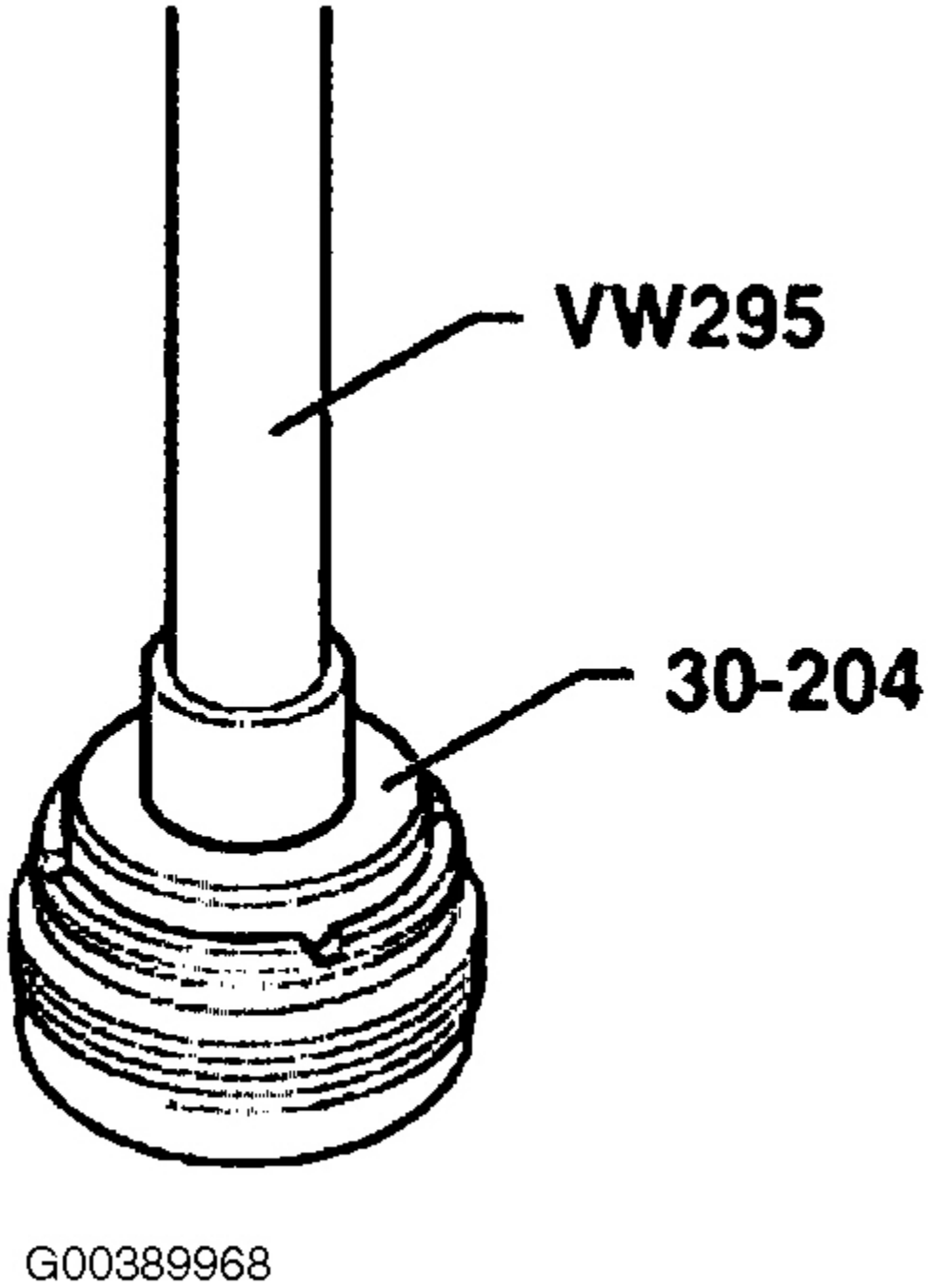

Fig. 176: Heating Final Drive Gear Wheel To Approx. 100° C And Installing

Courtesy of VOLKSWAGEN OF AMERICA, INC.

Use bolts -A- from repair kit to guide final drive gear into position during installation.

Bolting final drive gear and differential housing together

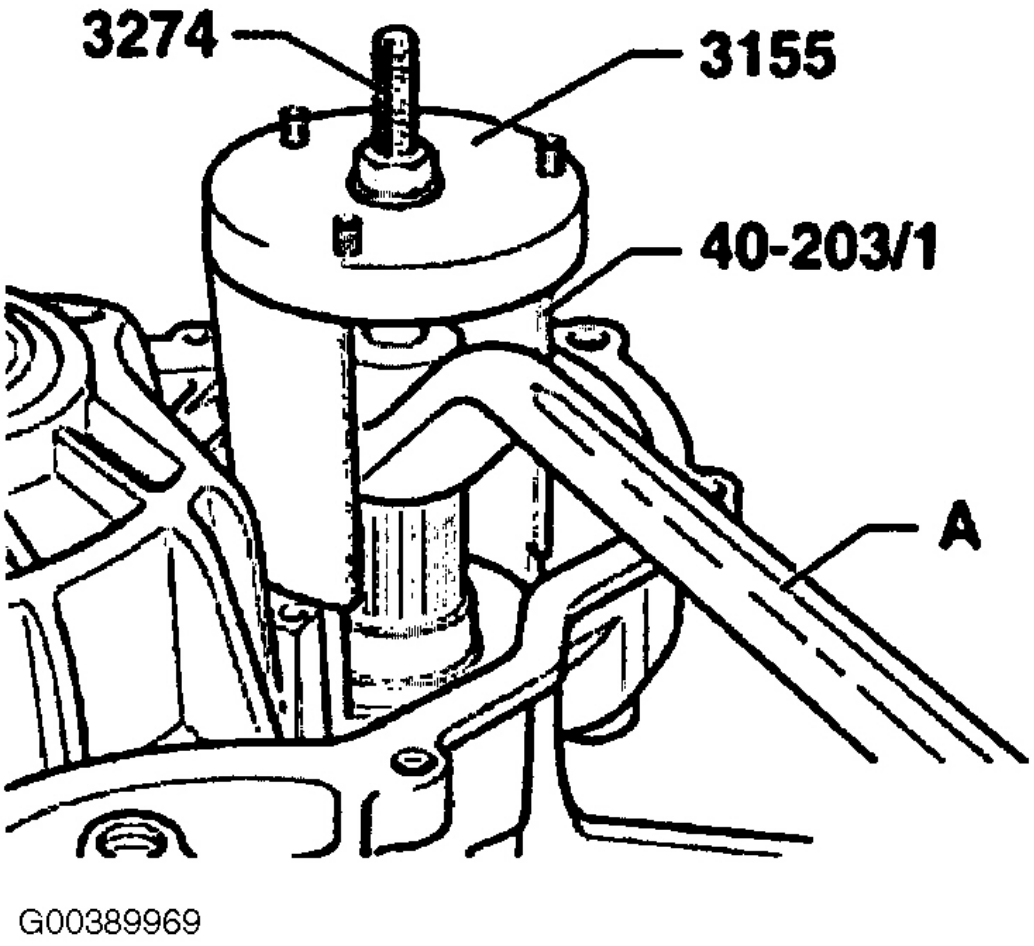

Fig. 177: Bolting Final Drive Gear And Differential Housing Together
Courtesy of VOLKSWAGEN OF AMERICA, INC.

Use special bolts with plates and nuts according to parts catalog.

Removing and installing differential pinion shaft spring pin

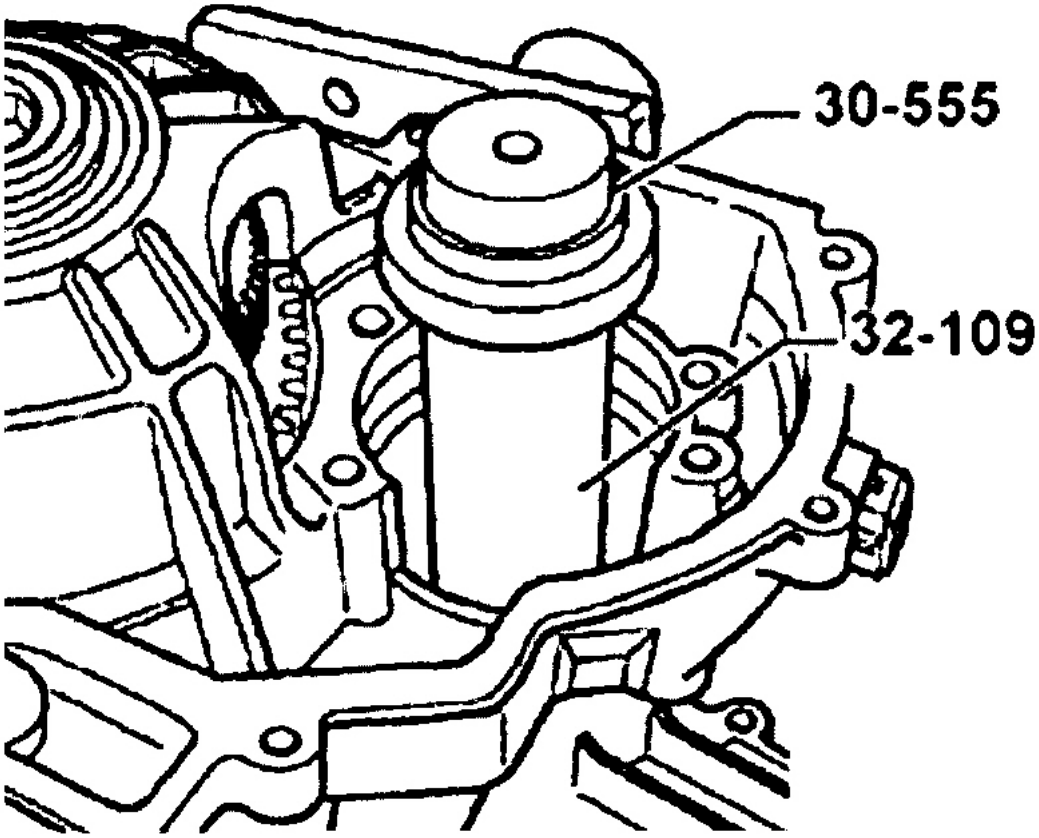

Fig. 178: Removing And Installing Differential Pinion Shaft Spring Pin
Courtesy of VOLKSWAGEN OF AMERICA, INC.

Removing

- Cover tapered roller bearing inner race and speedometer drive gear to avoid possible damage and ingress of metal particles.
- Knock-out spring pin with chisel, inserting chisel into circumferential groove.

Installing

- Knock fully into differential housing.

Installing differential side gears and pinion gears

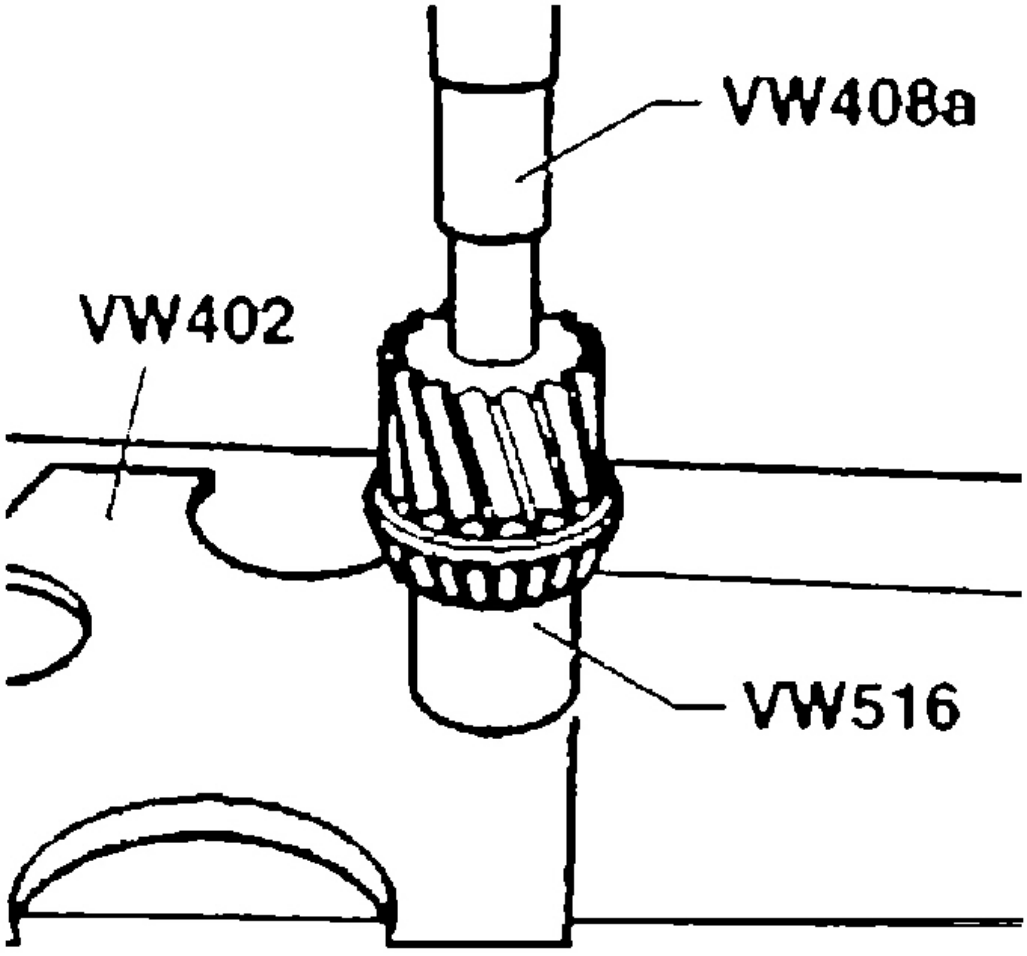

Fig. 179: Installing Differential Side Gears And Pinion Gears
Courtesy of VOLKSWAGEN OF AMERICA, INC.

- Lubricate one piece thrust washer with transmission oil and install.
- Install both side gears and secure (e.g. with flange shaft).
- Insert pinion gears (180° apart) and pivot into position.
- Push pinion shaft (arrow -A-) in until first pinion gear.
- Position threaded pieces (arrow -B-) in side gears. Installation position: step faces side gear
- Drive pinion shaft into final position and secure with spring pin.

Changed thrust washer for tapered ring

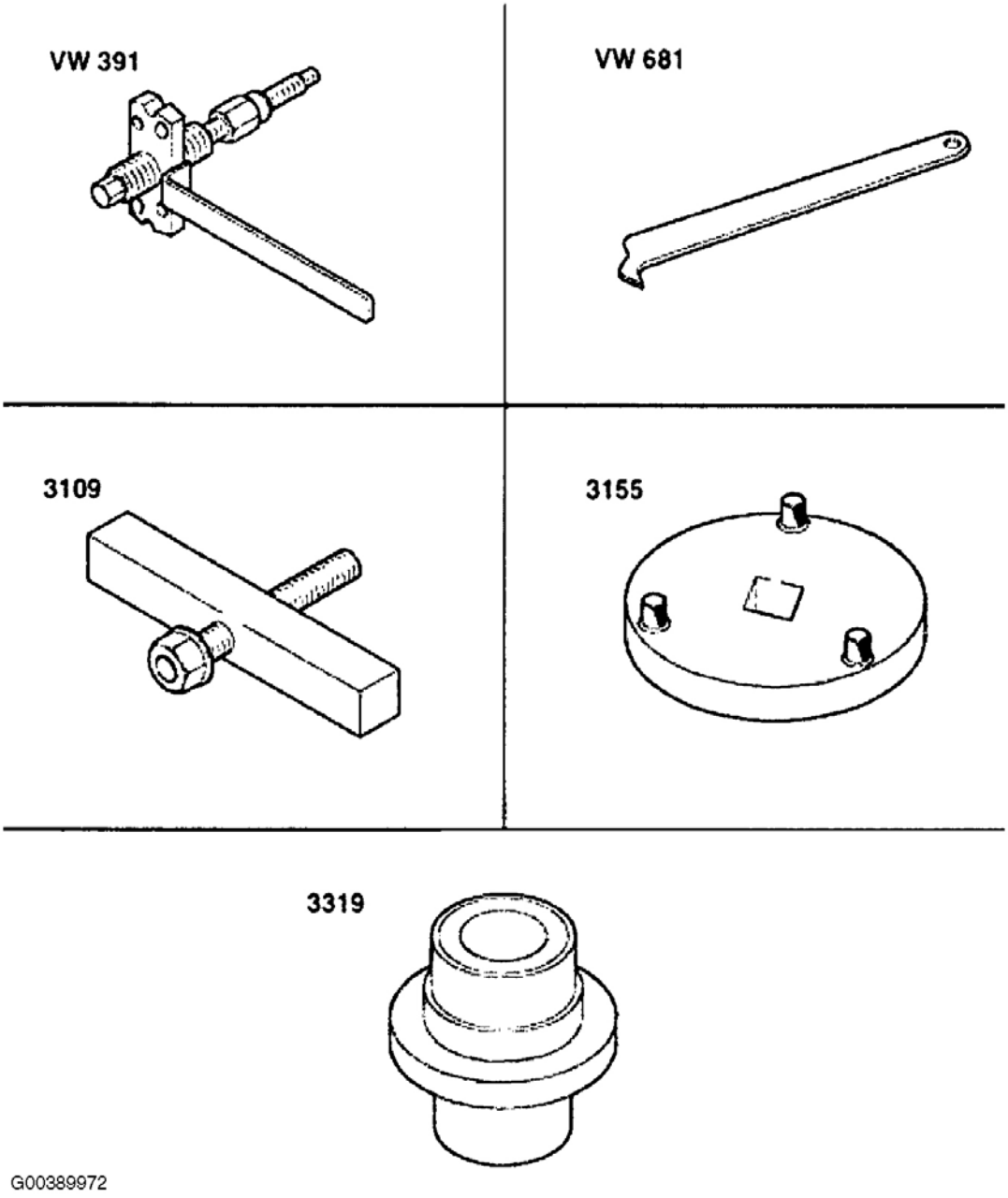

Fig. 180: Identifying Changed Thrust Washer For Tapered Ring
Courtesy of VOLKSWAGEN OF AMERICA, INC.

Installation position:

When the pads -A- are not present, the shoulder (arrow) points to spring -B-.

ADJUSTMENT OVERVIEW

NOTE: **If repairs have been carried out to the transmission it is necessary to adjust the input shaft, output shaft or differential if components have been replaced which have a direct effect on the adjustment of the transmission. Refer to the following table to avoid unnecessary adjustment:**

INPUT SHAFT, OUTPUT SHAFT AND DIFFERENTIAL - ADJUSTMENT OVERVIEW

		Input shaft See INPUT SHAFT, ADJUSTING	Output shaft See OUTPUT SHAFT, ADJUSTING	Differential See DIFFERENTIAL, ADJUSTING
Parts replaced:	Transmission housing	x		x
	Clutch housing	x	x	x
	Input shaft	x		
	Output shaft (final drive)		x	
	Differential housing			x
	Input shaft tapered roller bearing	x		
	Output shaft tapered roller bearing		x	
	Differential tapered roller bearing			x
	4th gear wheel	x		

DIFFERENTIAL, ADJUSTING

Special tools and equipment

- VW 387 Universal dial gauge bracket
- VW 385/17 End measuring plate
- 30-205 Thrust plate
- VW 407 Press tool
- Measuring dial gauge

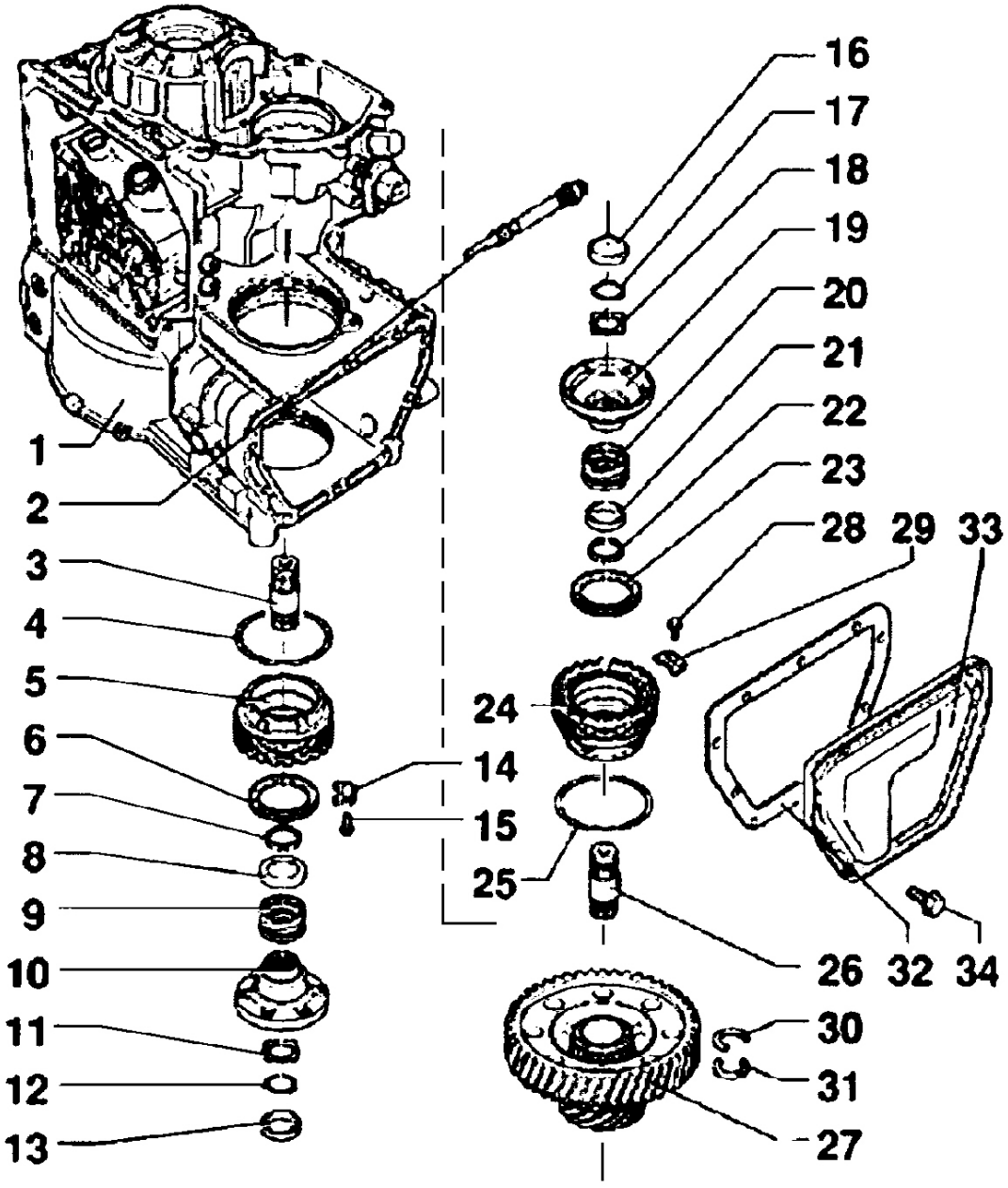

Fig. 181: Identifying Special Tools And Equipment
Courtesy of VOLKSWAGEN OF AMERICA, INC.

The differential must be adjusted, when

- Transmission housing

- Clutch housing
- Differential housing

or the

- Differential tapered roller bearing

have been replaced.

Adjustment overview. See **ADJUSTMENT OVERVIEW** .

- Press tapered roller outer race into clutch housing using press plate 30-205. See **REMOVING** .

NOTE: Tapered roller bearing inner and outer races are paired. Do not interchange!

- Press tapered roller outer race into transmission housing, without adjustment shim, using press plate 30-205. See **REMOVING** .
- Insert differential into clutch housing.
- Install transmission housing and tighten 5 bolts to 25 N.m.
- Mount dial gauge and "0" with 1 mm preload.
- Move differential up and down and recall play indicated on dial gauge (Example: 0.70 mm)

Note: If tapered roller bearings are to be re-used, mark the adjusting ring. The drive pinion does not need to be removed for removing and installing the differential.

1. Transmission Housing
2. Speedometer Drive
3. Output Shaft/Drive Flange
   Install thread facing drive flange
   Remove before taking out differential
   First adjust differential before installing
4. O-Ring (Always replace)
5. Adjusting Ring
   If used bearings are re-installed, mark installation position
   and position on marking again when installing.
   When installing new bearing, pay attention to setting instructions
6. Oil Seal For Drive Flange
   Before installing, pack space between sealing lips with multi-purpose grease
   Can be replaced with transmission installed
   Remove with VW 681
7. Tapered Ring
   Shoulder faces thrust washer
8. Thrust Washer
   Place over compression spring
9. Compression Spring
10. Drive Flange
    Insert with tapered ring, thrust washer and compression spring
    Remove before taking out inner circlip on bevel gear
11. Dished Washer
12. Circlip
13. Cover
14. Locking Element
15. Screw, 12 Nm
16. Cover
17. Circlip
18. Dished Washer
19. Drive Flange
    Insert with tapered ring, thrust washer and compression spring
    Remove before taking out inner circlip on bevel gear
20. Compression Spring
21. Thrust Washer
    Place over compression spring
22. Tapered Ring
    Shoulder faces thrust washer
23. Oil Seal For Drive Flange
    Before installing, pack space between sealing lips with multi-purpose grease
    Can be replaced with transmission installed
    Remove with VW 681
24. Bearing Body, 150 Nm
    When installing new bearing, pay attention to setting instructions.
25. O-ring (Always replace)
26. Output Shaft/Drive Flange
    Install thread facing drive flange
    Before removing, take out differential
    First adjust differential before installing
27. Differential
    Before removing differential, take out bearing body, adjusting ring and output shafts
28. Screw, 12 Nm
29. Locking Element
    After adjusting tapered roller bearings, secure bearing body and adjusting ring.
30. Circlip
    First remove drive flange before removing circlip
31. Circlip
    First remove drive flange before removing circlip
32. Seal (Always replace)
33. Cover (For differential)
34. Screw, 28 Nm
    Insert with locking fluid AMV 185 101 A1

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Fig. 182: Measuring Differential End Play
Courtesy of VOLKSWAGEN OF AMERICA, INC.

Determining shim thickness

The specified bearing preload is obtained by adding a constant figure (0.40 mm) to the reading obtained.

Example:

DETERMINING SHIM THICKNESS - DIFFERENTIAL BEARING PRELOAD

Reading	0.70 mm

+ Preload (constant figure)	0.40 mm
Thickness of shim =	1.10 mm

- Remove transmission housing and pull tapered roller bearing outer race out from transmission housing. See **REMOVING** .
- Insert shims of correct thickness, thickest shim first.

The following shims are available:

SHIM THICKNESS AVAILABILITY - DIFFERENTIAL BEARING PRELOAD

Size (mm)	Part No.
0.65	02A 409 210
0.70	02A 409 210 A
0.75	02A 409 210 B
0.80	02A 409 210 C
0.85	02A 409 210 D
0.90	02A 409 210 E
0.95	02A 409 210 F
1.00	02A 409 210 G
1.05	02A 409 210 H
1.10	02A 409 210 J
1.15	02A 409 210 K
1.20	02A 409 210 L
1.25	02A 409 210 M

If the size of shim required is larger than those listed in the table, insert two shims totalling the correct figure.

Varying tolerances make it possible by measuring the shims to obtain the exact shim thickness required.

- Press outer race in again and tighten transmission housing securely.